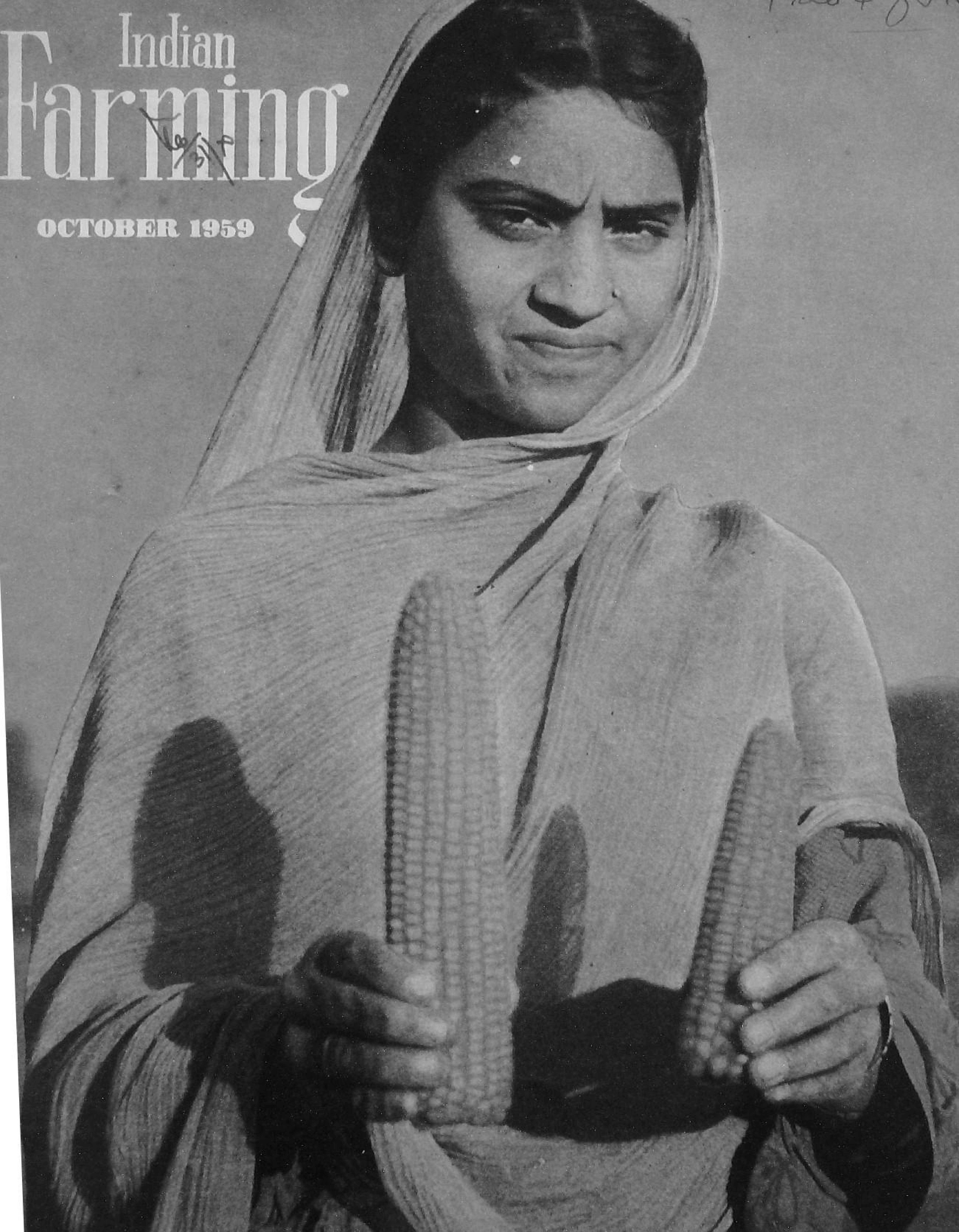
Indian
Farming

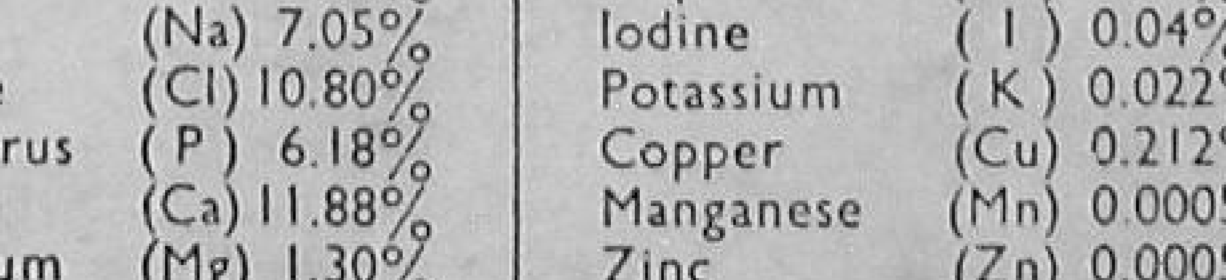
OCTOBER 1959



get the best
out of your
livestock and poultry

Livestock and Poultry, like human beings, require a number of essential minerals for healthy development. Star Brand Feed Supplement supplies all these minerals in the correct proportion.

STAR BRAND
FEED SUPPLEMENT



STAR BRAND FEED SUPPLEMENT CONTAINS

Protein matter		13.25%	Sulphur	(S)	0.25%
Sodium	(Na)	7.05%	Iodine	(I)	0.04%
Chlorine	(Cl)	10.80%	Potassium	(K)	0.022%
Phosphorus	(P)	6.18%	Copper	(Cu)	0.212%
Calcium	(Ca)	11.88%	Manganese	(Mn)	0.0005%
Magnesium	(Mg)	1.30%	Zinc	(Zn)	0.0005%
Iron	(Fe)	4.05%	Boron	(B)	0.0005%
Silicon	(Si)	3.36%	Cobalt	(Co)	0.0004%

Manufactured & Distributed by **SHAW WALLACE & CO., LTD.**
CALCUTTA MADRAS BOMBAY NEW DELHI

SWC-20

OCTOBER 1959

Vol. IX No. 7

OUR COVER

How a hybrid maize cob dwarfs a local one. The cob on left is Punjab Hybrid *that is being recommended to Punjab farmers, while that on right is the conventional variety. Imagine the difference in yield that it would make if we take to hybrid maize in right earnest.*

Photo by M.G. Kamath

EDITORIAL BOARD

Dr. M.S. Randhawa, Vice-President, Indian Council of Agricultural Research (*Chairman*); Dr. B.N. Uppal, Agricultural Commissioner with the Government of India; Shri Lakshmi Sahai, Animal Husbandry Commissioner with the Government of India; Dr. B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi; Shri J. V. A. Nehemiah, Extension Commissioner, Ministry of Food and Agriculture; Shri S.K. Mirchandani, Secretary, Indian Council of Agricultural Research; Shri M.G. Kamath, Production Specialist, Extension Wing, Ministry of Food and Agriculture; Shri Harkirat Singh, Editor, Indian Council of Agricultural Research.

Chief Editor and Production Specialist
Prem Nath

Business Manager
K. E. Sankaran

SUBSCRIPTION RATES

Annas 12 or 75 nP per copy
Rs. 9 for 12 issues

Indian Farming

CONTENTS

Editor's Page	3
Man of the Month —*S. L. Katyal*	4
Let's Say a Firm "No Admission" to Flukes —*S. S. Ahluwalia*	7
Waste Straw Helps Cotton Use Nitrogen Better —*P. S. Gupta* and *R. P. Sharma*	10
Coriander is M.P's Dollar-earner —*B. G. Nikam, F. K. Pawar* and *S. N. Kulkarni*	11
Mites Too Are Big Thieves of Crops —*J. G. Pawar* and *V. S. Rathore*	13
Czech Co-operation Gets a Renovation	17
News and Pictures	20
Farm Flashes	21
How They're Fighting Contagious Diseases of Animals —*Sir Thomas Dalling*	22
Getting the Best Out of Fertilizers	28
The Farmer's Points of View	30
What's New in Farming	31
Newsletter From States —*Rama Das*	32
The Rambler Reports	35
Does Paddy Really Want Standing Water? (*Research Note*) —*B. N. Gosh*	37
Readers Write	40

Editor : **Harkirat Singh**

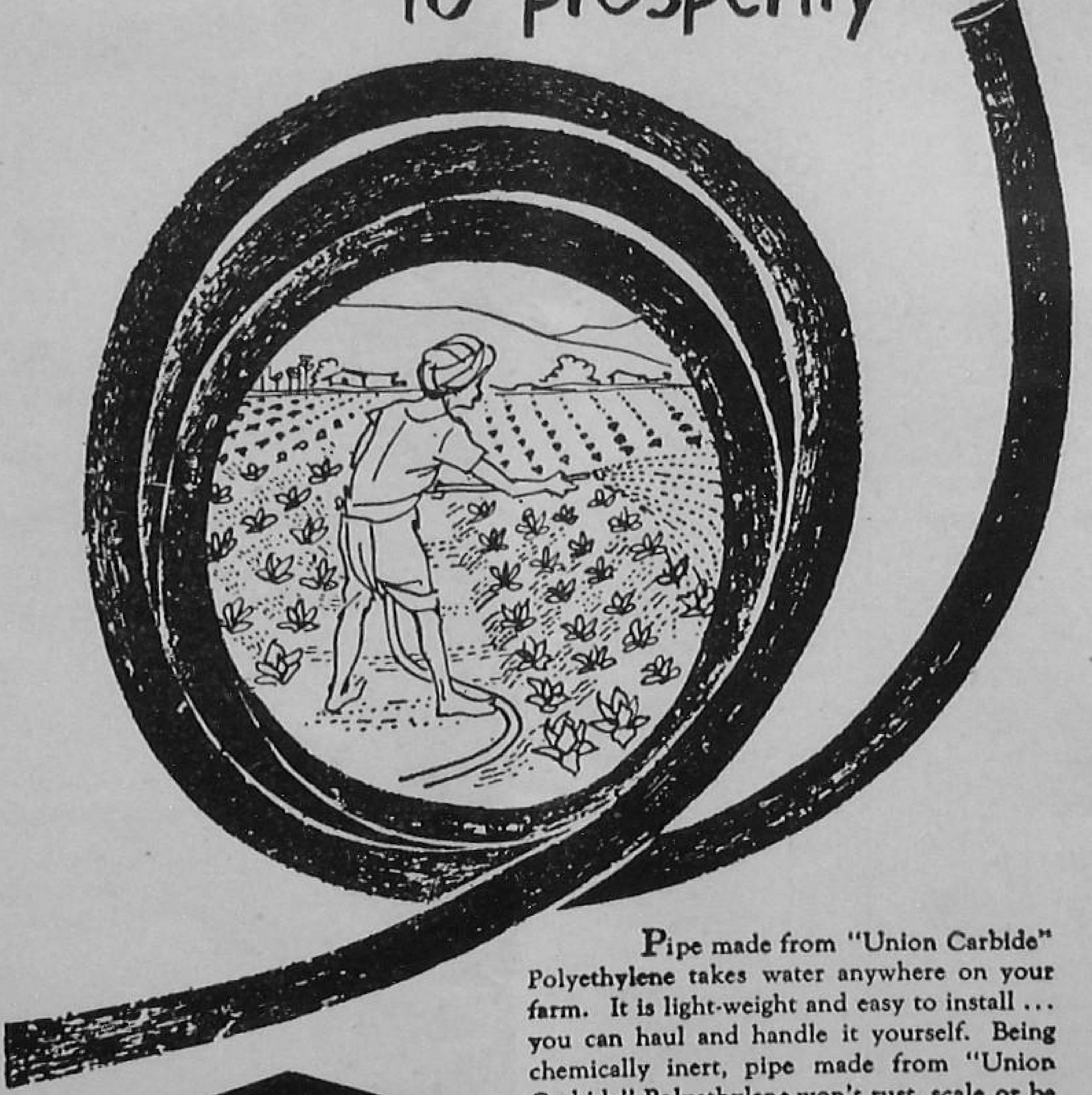
ISSUED BY

THE INDIAN COUNCIL OF AGRICULTURAL RESEARCH

NEW DELHI

Any article or illustration published in "Indian Farming" may be reproduced in any periodical provided due acknowledgment is made to the source

pipeline to prosperity



Pipe made from "Union Carbide" Polyethylene takes water anywhere on your farm. It is light-weight and easy to install ... you can haul and handle it yourself. Being chemically inert, pipe made from "Union Carbide" Polyethylene won't rust, scale or be affected by soil acids.

Write to us and we shall be happy to place you in touch with manufacturers of pipe made from "Union Carbide" Polyethylene.

National Carbon Company (India) Limited will soon manufacture Polyethylene at Trombay Island, Bombay.

UNION CARBIDE
TRADE MARK

Polyethylene

INDUSTRIAL PRODUCTS DIVISION

NATIONAL CARBON COMPANY (INDIA) LTD.

BOMBAY • CALCUTTA • DELHI • MADRAS

The term UNION CARBIDE is a registered trade mark of Union Carbide Corporation, U.S.A.

NCC

HYBRID MAIZE

IN the context of the difficult food situation that we are facing, it may be said that the Conference on Hybrid Maize sponsored by the Indian Council of Agricultural Research in New Delhi recently did not come a moment too soon. In the U.S.A., hybrid maize has stepped up the acre-yield by about 30 per cent. Natural, therefore, that during the last 25 years hybrid varieties have replaced almost all the older types there. What's more, maize has proved most versatile in their hands. So much so that maize and maize products rank second only to iron in importance in the U.S. economy. There are today over 600 maize products in use for human consumption, livestock and industry!

Trials at Government Research Stations in India also suggest a bright future for hybrid maize in the country, for yield-increases of 80 to 120 per cent have been recorded. What is needed now is production of hybrid maize seed on a commercial scale. This, no doubt, is a specialists's job, calling for technical know-how and resources far beyond the command of the average farmer.

This becomes clear when we know how hybrid maize seed is produced. There are three essential steps: maintenance of the four parental inbred lines, production of two parental single crosses, and crossing of the two single crosses for the production of double-crossed seed. While the first two steps will inevitably have to be undertaken by official and semi-official organizations having the requisite facilities in terms of land, equipment and trained personnel, the final step can be carried out by co-operatives or progressive farmers. A co-op in the Punjab is already doing this.

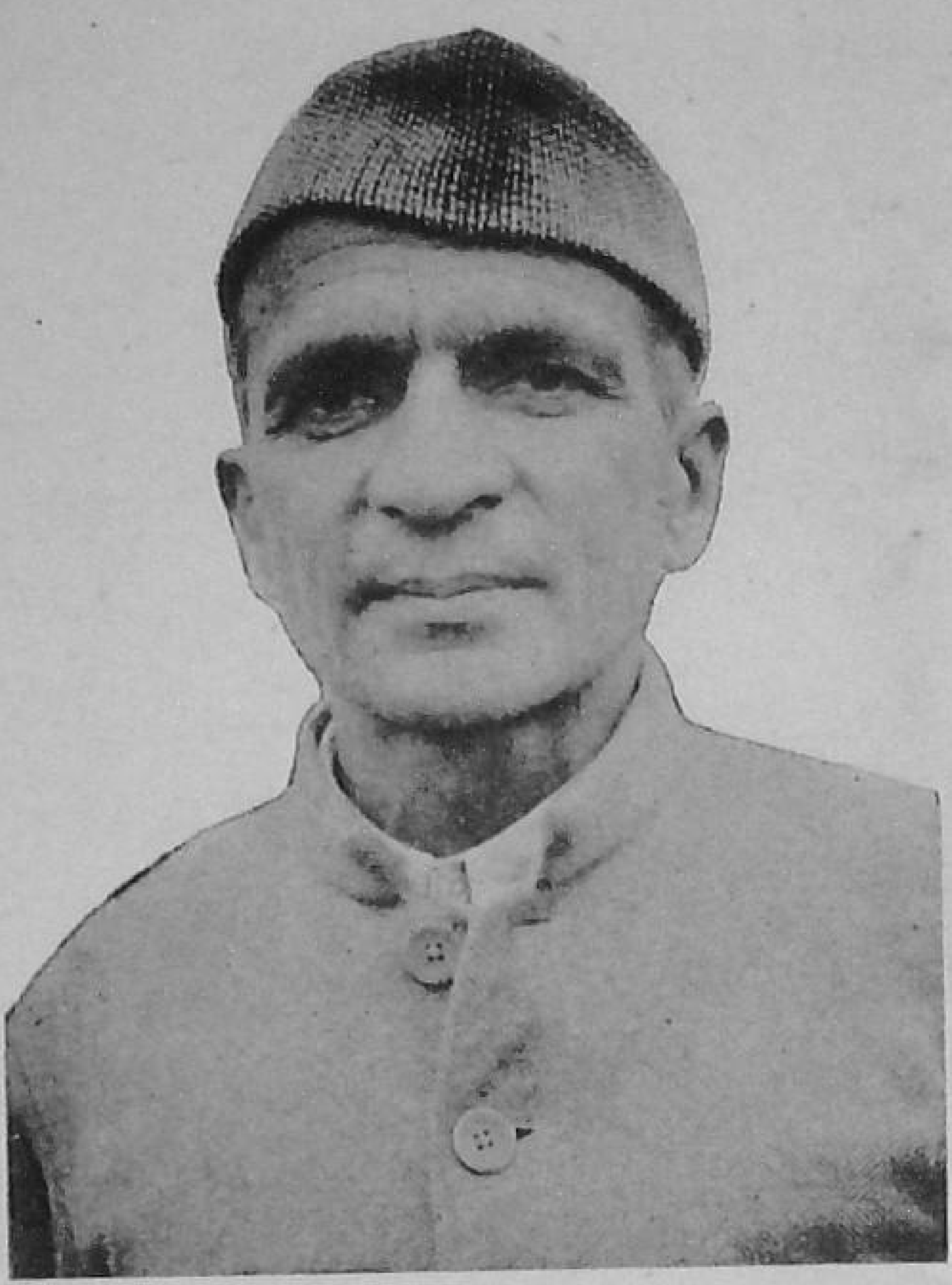
Not only that. Hybrid maize cultivation also presupposes a fairly high standard of agronomic practices—proper spacing, fertilization, etc., for only then will a hybrid variety manifest its true yield potential. The hybrid crop, because of its heavier yield, will deplete the soil of its nutrients more rapidly; hence, heavier fertilization than for ordinary varieties would be required. It must also be remembered that over 90 per cent of our maize area is rain-fed, and generally low in soil fertility. If increased fertilization is to be recommended, the additional cost to the farmer on fertilizer and irrigation will have to be kept in view. Adequate research on these aspects is, therefore, essential if we have to make any real headway with hybrid maize.

On the advisory side, the farmer will have to be told how to use hybrid maize. He will have to be told not to use the seed from his hybrid crop for planting next year, lest the yield goes down. Demonstrations will be necessary to show how hybrid vigour works, and its limitations.

Apples Have Paid Him Well

by

S. L. Katyal



Shri Lakshmi Singh

SIMPLE, *khadi*-clad Shri Lakshmi Singh Sirkek, Proprietor of "Madhuban Orchards" and Nurseries at Kotgarh in Himachal Pradesh impressed me at once. He gets a gross income of about Rs. 45,000 from his two-acre apple orchard, and is the winner of the First Prize in the "Udyan Pandit" competition in apple-growing in Himachal Pradesh. No wonder he firmly believes that apples are more paying in Kotgarh than other temperate fruits like peaches, plums and cherries.

"I owe all my success," says Shri Singh, to my father-in-law, the late Mr. Satyanand Stokes, the well-known American missionary who settled down in Kotgarh. He foresaw a great future for the apple industry there, and became a pioneer in apple orcharding in the Simla Hills. He used to say, "There is no substitute for hard and intelligent work." Shri Lakshmi Singh took that advice seriously, and it has paid him well!

Shri Singh had his early education at the D.A.V. College, Lahore. He got training at Nagrota in bee-keeping in 1935 and in fruit preservation at Lyallpur in 1937. From 1937 to 1946, he worked with his father Thakur Manohar Das, owner of "Gopalpur Orchards". Shri Singh started life independently in 1946 when he was given about 4½ acres of third-class forest land by his father-in-law, Mr. Stokes. Clearing it cost him Rs. 1,000 per acre. He began putting the area under apples.

"Madhuban Orchards" is situated on the northern aspect at an altitude of about 6,500 feet above sea level, and is a quarter mile off the main road and bus-stand. The natural forest trees around serve as wind-breaks and protect the orchard. The soil is loamy clay.

The orchard is fenced on the lower border by a continuous retaining wall which also conserves the soil. The upper border is fenced by wooden poles and reinforced with shrubs. Shri Singh is planting plums, peaches and apricot trees, which will serve as permanent posts of fencing. He feels that these trees, flowering earlier than the apples, will attract bees and thus ensure pollination of the apples.

INTENSIVE PLANTING

Land in Himachal Pradesh being very scarce, Shri Singh has found out a novel method of intensive planting. The treess are planted 18 feet apart by the square system, in the first instance. After about ten years, alternate trees in the second row are removed, when they have already given fruit for five years. After 12 years, the other trees in the second row are also removed, thus leaving a spacing of 36 feet for the remaining trees. Shri Singh says that he has thus been able to get about twice the returns which he would have got by planting the trees 36 feet apart from the very beginning. Apples of the same variety are used as fillers and permanent trees.

The orchard has been divided into two blocks, "A" and "B". Block "A" was planted in 1944 with seedlings and the plants were grafted in their permanent places in the field. Seeds of the varieties *Newton Pippin* and *Crab Apple* were sown as root-stocks. Plants in this

block are now 15 years old. Shri Singh has kept a regular record of all these plants. Block "B" was planted in 1946 with grafts.

Shri Singh's lay-out is such that the steep land of his apple plantation does not invite erosion. The base line is in conformity with the contour of the land.

VARIETIES

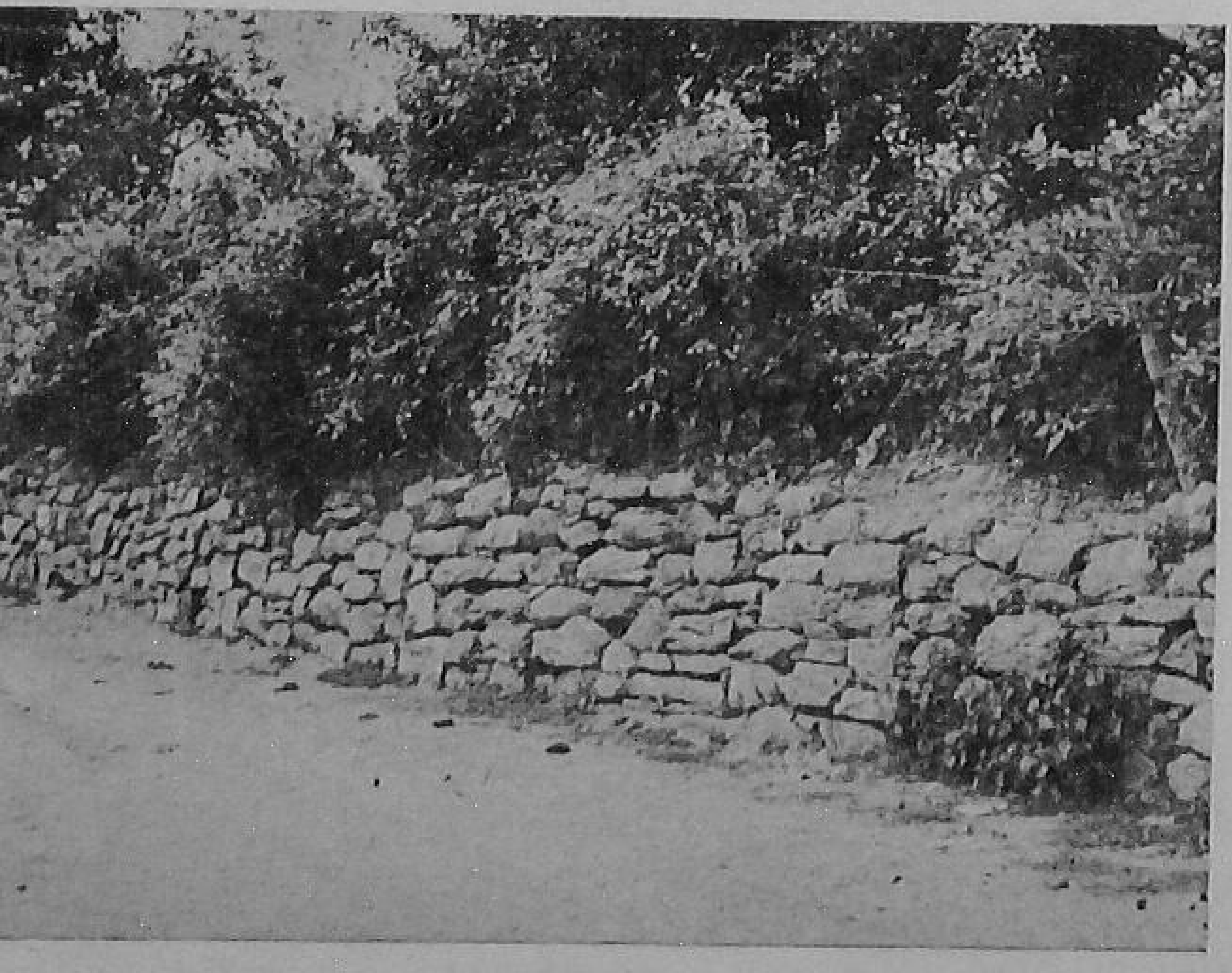
The main commercial varieties of "Madhuban Orchards" are *Royal Delicious, Richa Red, Red Delicious* and *Golden Delicious.* Besides, a few others have been planted for varietal collection, e.g., *McIntosh, Quarantine, Newton Pippin, Red Gold, Wine Sap Viginia, Williams Favourite, Summer Queen, Granny Smith, Johna Red, Scarlet Stammered* and *Wine Sap Viginia. Johna Red* is an early-maturing variety, while *Scarlet Stammered* and *Wine Sap Viginia* are late ones suited for cider-making. These three varieties serve as good pollinators. *Golden Delicious* generally is an alternate bearer and should not be solely depended upon as a pollinizer. According to Shri Singh, the fewer the varieties the better, because they are easy to manage and do not interfere with farm operations. The trees in "Madhuban Orchards" are regular bearers.

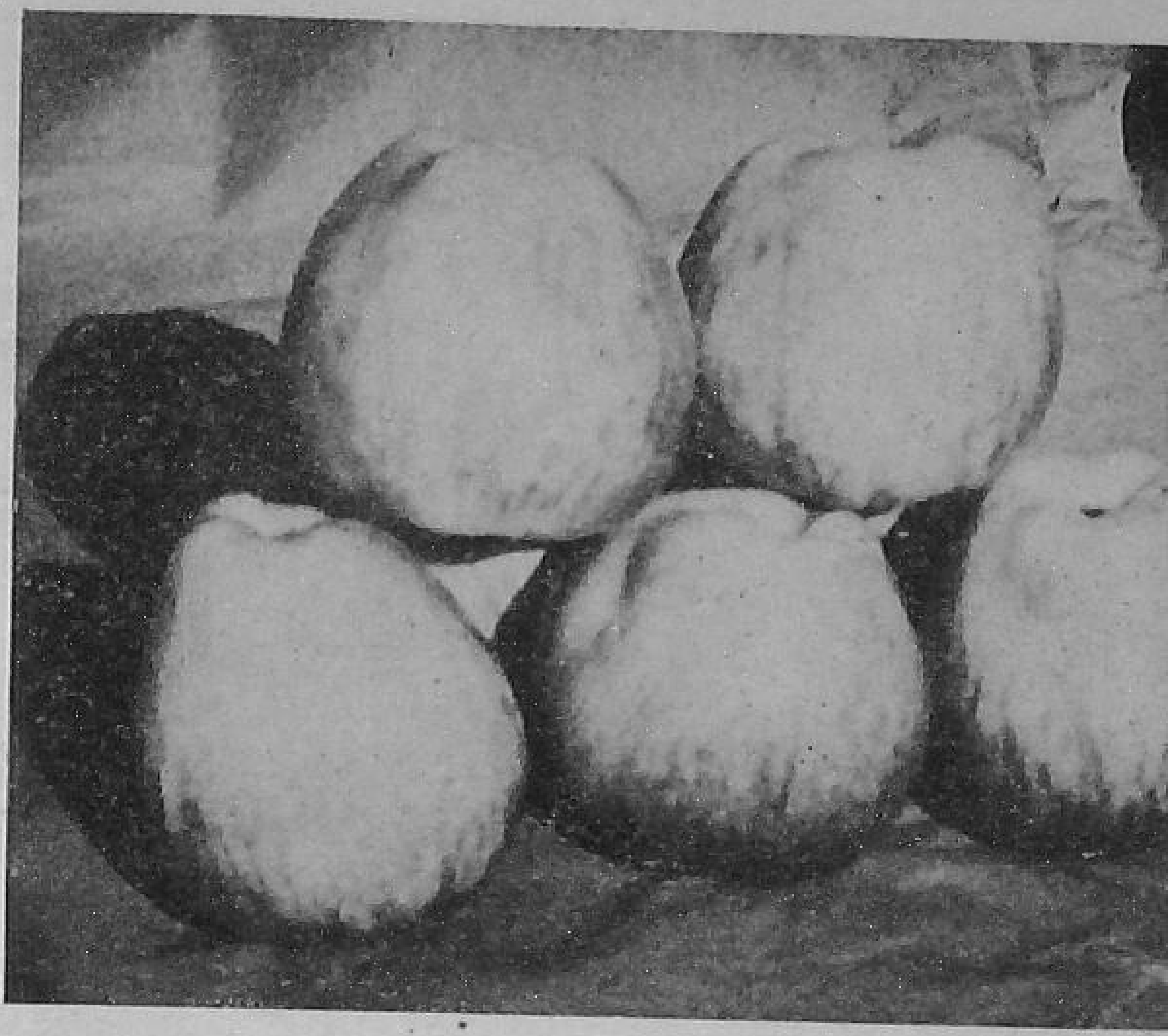
CULTIVATION

The trees have been trained by the "modified leader" system. They are pruned very moderately when they are quite young and do not respond to heavy pruning.

The orchard is cultivated three times a year. In the rainy season, no cultivation is done and the *piploo* grass which conserves the soil and provides mulch is permitted to grow. Mulching is done twice a year, once in August before the picking, and then again in November-December before the winter cultivation. The soil becomes rich in organic matter and thus resists erosion. It also holds more water, so necessary for the orchard. Farmyard manure prepared in compost pits is applied every third year at 2½ maunds per tree in the case of older plants. Young plants up to five years are manured every year. This is done in November-December just before snowfall. In addition, three to six pounds of ammonium sulphate is added in March along with superphosphate at two to four pounds per tree. With appropriate manuring and soil management, Shri Singh has been able to get the trees to bear by the third to fourth year.

A stone wall helped by plums, peaches and apricots keeps soil erosion away from "Madhuban Orchards"





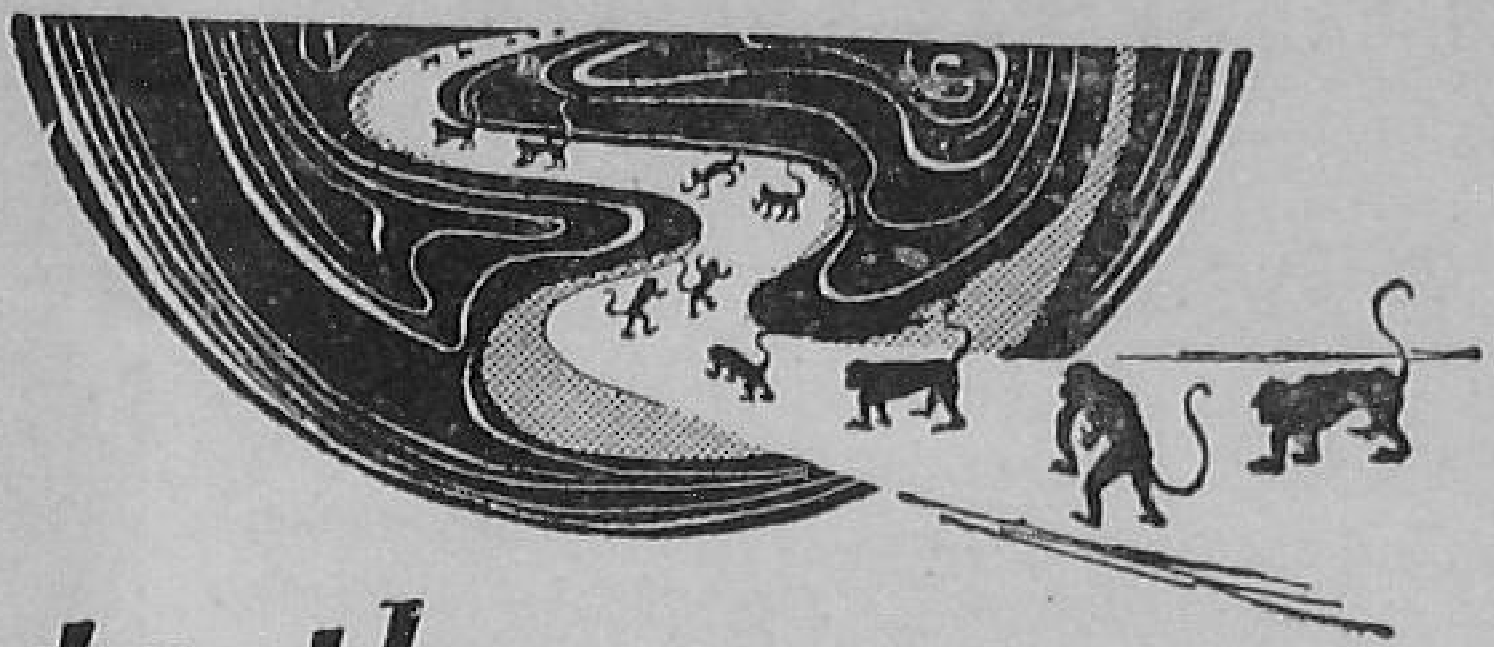
Red Delicious **apples that would any day win a prize**

Thinning the fruits is a regular practice in "Madhuban Orchards". The size of the crop is thus improved, and also a good colour attained. Four pickings are done as and when the fruits mature and attain desirable size and colour.

The orchard is sprayed twice a year against insect pests, once with oil and again with Bordeaux mixture or other copper preparations. Sometimes, combined sprays are given. Sulphur sprays are also included in the regular spraying schedule against fungus diseases.

In the first fortnight of June, the tree trunks and the soil beneath trees is sprayed with "Dieldrex 18" against root borers and beetles (one ounce in four gallons of water). In the last week of June or the first week of July, before picking starts, "Eldrex" five per cent dust is applied to the soil for checking fruits flies which begin to emerge from the soil where they hibernate during winter. This also helps in controlling beetles. Bordeaux paint mixed with DDT is also applied to

CONTD. ON PAGE 40



A way to the moon

(AN ANCIENT INDIAN TALE)

'Our parents are always saying that we are too young to know anything,' complained the young monkeys as they met in a forest. 'We are *not* too young,' they cried.

'And we shall prove that,' said their leader. 'We will form ourselves into a band, and then we can do just what we like.'

When the meeting was over, they all went home. That night, they didn't sleep beside their parents; they slept all by themselves, in groups, on the topmost branches of the trees by a lake.

Around midnight, one of the young monkeys woke up. Looking down from where he sat, he saw the bright moon shining on the lake below.

'Get up, get up, my friends!' he shouted. 'The moon has fallen into the lake. Let us go and pull it out before anyone else does so.'

'Oh! What a splendid idea!' cried his friends. 'How very famous we shall be!'

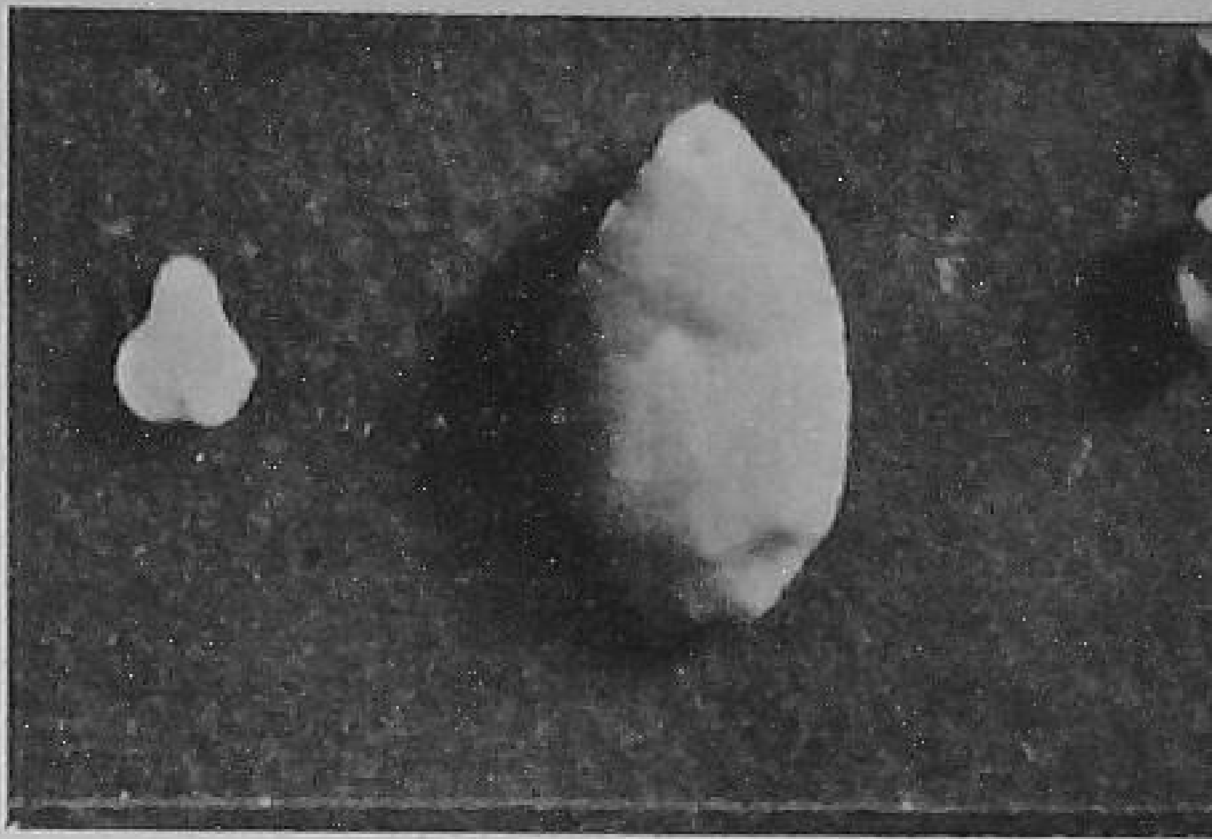
'The only way to reach that moon,' said the leader, 'is for us to form a chain.' So a long monkey-chain was formed, each monkey firmly grasping the tail of another. With a splash that resounded throughout the forest, the whole band, leader foremost, jumped plump! into the water—and there they drowned.

MORAL: Beware of the advice of those who merely *think* they know; listen to those who *really* know. Consider vanaspati. Leading authorities on health and nutrition agree that vanaspati is a wholesome food and a valuable addition to the Indian diet. DALDA Vanaspati—the brand trusted by millions of housewives—is made from pure vegetable oils, according to strict Government specifications. It is an all-purpose cooking medium and a rich source of energy-giving fats. DALDA contains extra nourishment, too! There are 700 International Units of Vitamin A added to every ounce plus 56 I. U. of Vitamin D. Yes, DALDA is more than a cooking medium—it's a food!

DL. 476-X 52

HINDUSTAN LEVER LIMITED, BOMBAY.

Let's Say a Firm "No Admission" To Flukes



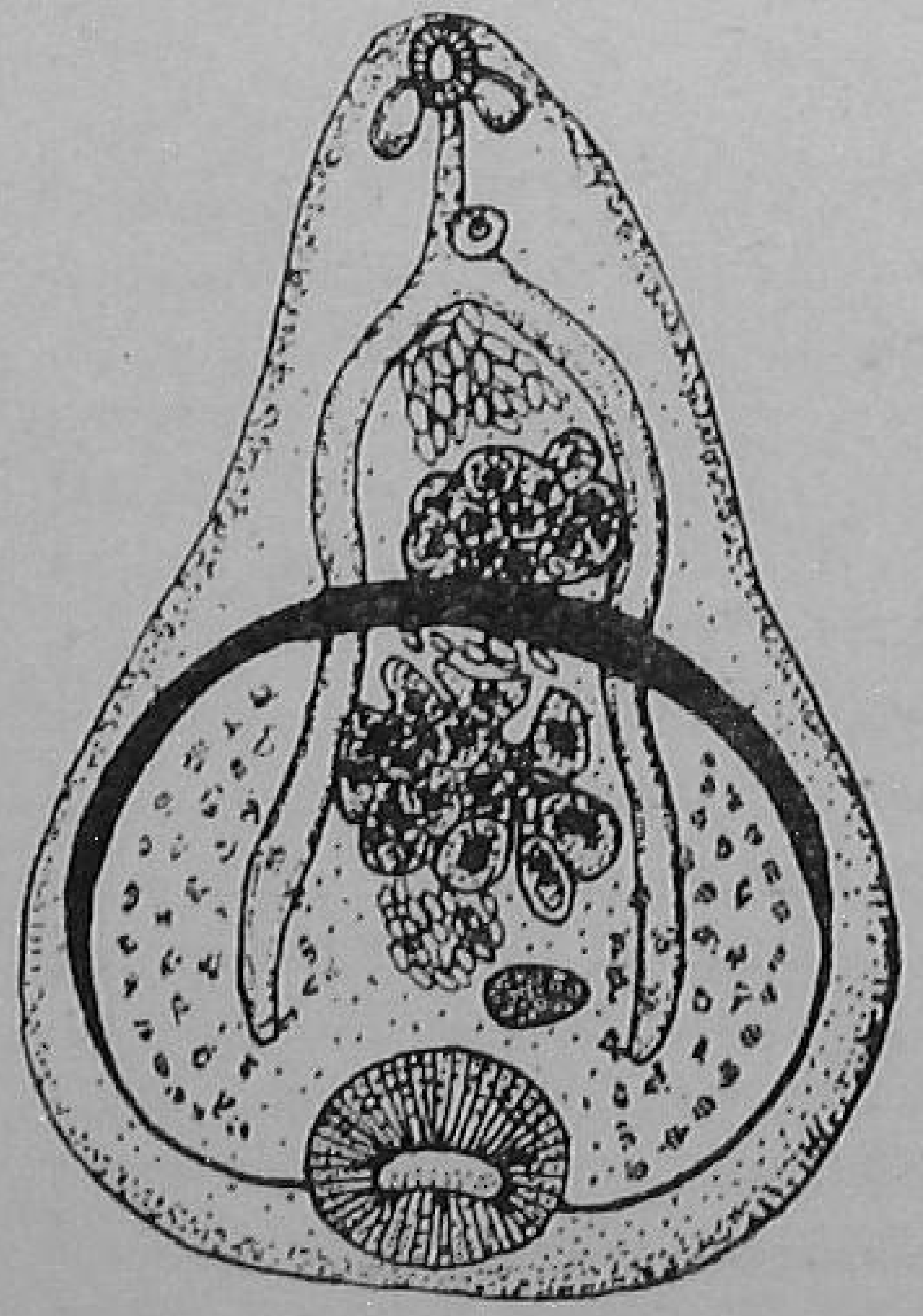
The three fluke parasites: (*from left to right*) the amphistome, the giant intestinal fluke and the Malaya fluke

by

S.S. Ahluwalia

U.P. College of Animal Husbandry and Veterinary Science Mathura

IN 1843, post-mortem of an Indian sailor who died in the Seamen's Hospital, London, was conducted by Dr. Busk. A large number of leaf-shaped flat worms were observed in his intestines, which were held responsible for his death. The worm was later named Busk's fluke, or the large (giant) intestinal fluke of man (*Fasciolosis buski*). Later, in 1876, a second type of fluke, the amphistome of man (*Gastrodiscoides hominis*), was discovered parasitizing the intestines of an Assamese by two British doctors, namely, Lewis and McConnel. Subsequently, another form, the Malaya fluke (*Artyfechinostomum sufrartyfex*) was recovered from an Assamese girl by Dr. Lane in 1913.



The internal structure of the amphistome

It was estimated in 1947 that a crore of people in eastern Asia harbour these flukes. In Shaohsing district of China, the large intestinal fluke of man was so prevalent as to be one of the principal causes of severe illness and loss of life. It is believed to have wiped out entire families.

Oriental countries appear to be the home of these three worms, which were subsequently found to be of very common occurrence among the pigs of these areas, particularly, in India, in states like Assam, Bengal, Bihar and Orissa. Cases of human infestation with these flukes have been reported by Buckley during his survey in. 1939 to be common in eastern India, especially Manipur Valley of Assam where in one district, Kamrup, 42 per cent of the population, mostly children, was found affected with one variety alone (*G. hominis*). Besides, there are two reports from Madras of deaths caused by heavy infestation with the Malaya fluke.

The giant intestinal fluke is flattened, somewhat like a leaf, but has a fleshy body. It measures one inch to three inches in length, half to one inch in breadth and $\frac{1}{10}$ inch in thickness. The amphistome fluke is much smaller, nearly half an inch in length, and has a disc-like body with a narrow, conical anterior part. The Malaya fluke, measuring half an inch in length and a quarter inch in breadth, resembles a small, oblong leaf. All the three worms are bright reddish in colour when alive, and can perform sluggish movements by contracting and expanding their muscular bodies.

The internal structures of all the three flukes are almost similar. They have a powerful cup-shaped sucker for attachment to the gut-wall of the host animal. Each individual worm has both male and female reproductive organs and can produce about 25,000 eggs every day. These minute eggs, which are not visible to the naked eye, get mixed up with the intestinal

contents and are constantly passed out in enormous numbers in the faeces of the infected person or pig.

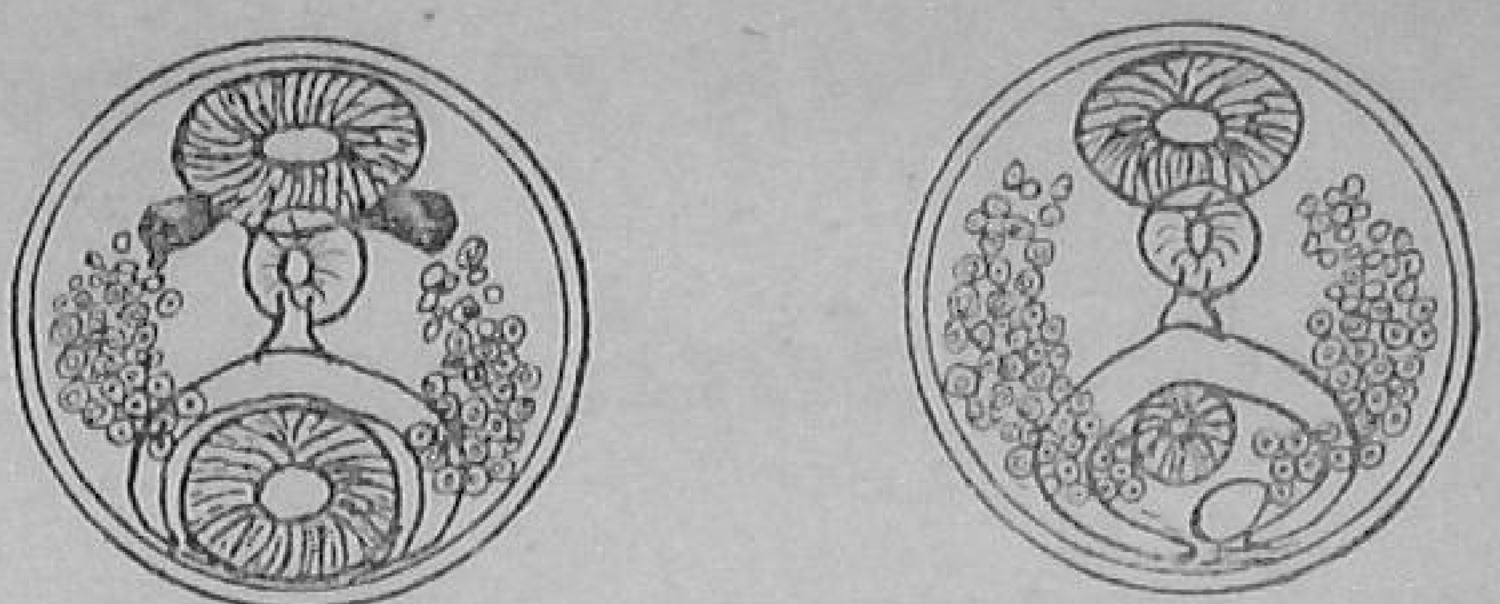
LIFE-HISTORY

The eggs can develop further only in the open, in the presence of water and under favourable conditions. They hatch out into young larvae. The development of the latter can take place only inside the body of a suitable type of fresh-water snail. After a few months, a large number of the later larval stages, or the juveniles, emerge from the infected snail and swim about in the surrounding water like the tadpoles of frogs. They search out suitable plants growing in water, and finally settle down on their leaves or fruits, and become rounded in shape. Each larva is, in fact, the future fluke in miniature, but has only a few of the adult characters like the organs for feeding and attachment ; it is now ready to infect man or pig.

To protect itself from adverse environmental conditions, the larva secretes a hard substance round itself and lies in a dormant state inside this protective envelope (cyst). This infective stage cannot develop further until it reaches the intestines of man or pig. This opportunity is afforded when the aquatic vegetation and fruits growing in contaminated waters are consumed raw by either of these.

According to Buckley, the fruits of the following water-plants are commonly eaten raw or cooked in Assam: *siantepa* or *panical* (*Ottelia alismoides*), *moukwa* (*Nymphoea lotus*), *singhara* (*Trapa natans*), *nikhoru* (*Euryale ferox*), *badam* (*Nelumbo nucifera*) and *helook* (*Nymphoea* sp.).

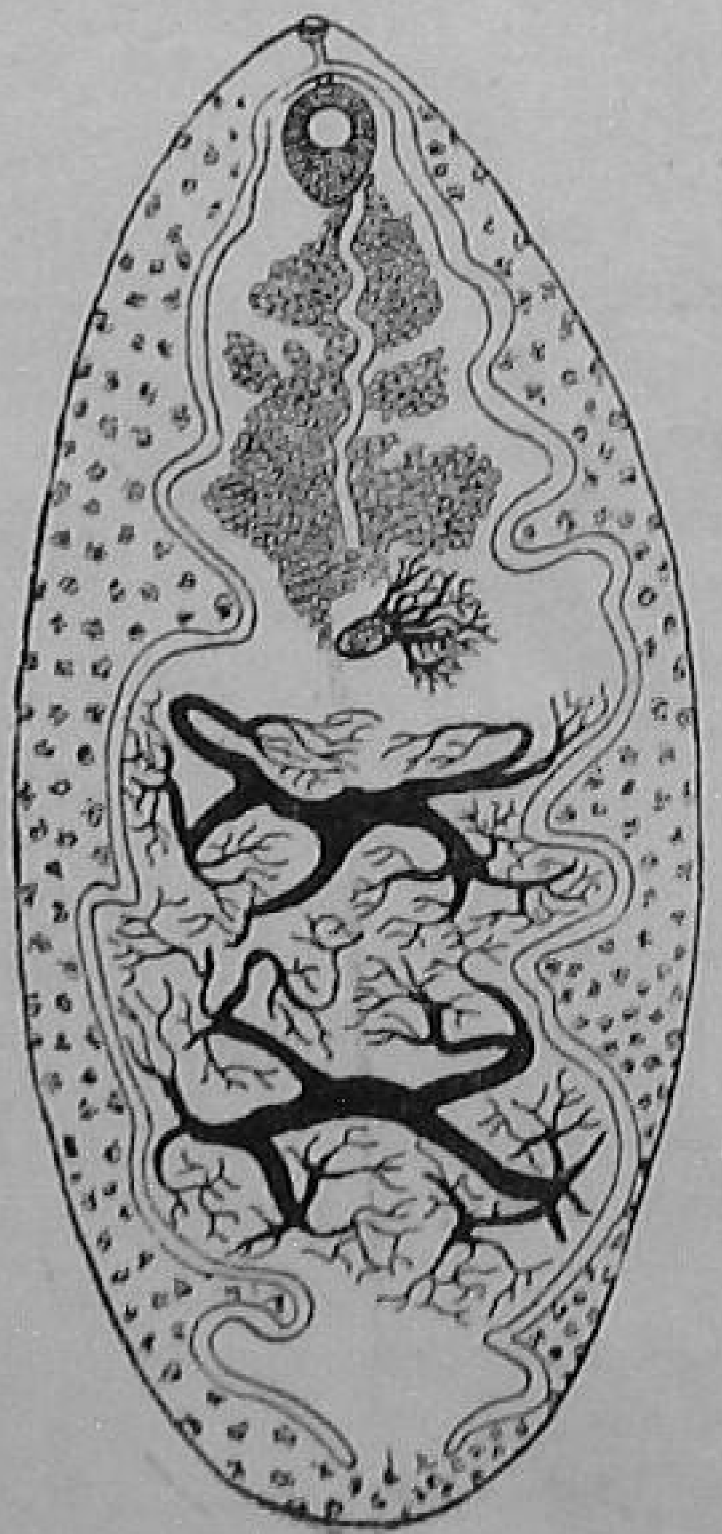
Singharas are commonly used as food, the skin of the nut being peeled off with the teeth and lips. The



The two cysts (infective stage)

consumer, in doing so, unwittingly takes in some of the cysts. Each nut may have up to 200 cysts upon it, and a heavy dose of infection may result from a modest meal of nuts.

On reaching the intestines, the hard outer coat of the cyst is dissolved away and the young fluke gets liberated. It crawls about on the soft lining of the gut and finally anchors itself on a suitable spot by means of its organ of attachment (sucker). Here it feeds at the expense of the host, and in a few months grows to maturity, when it starts passing out eggs. The life-cycle is thus repeated.



The internal structure of the giant intestinal fluke

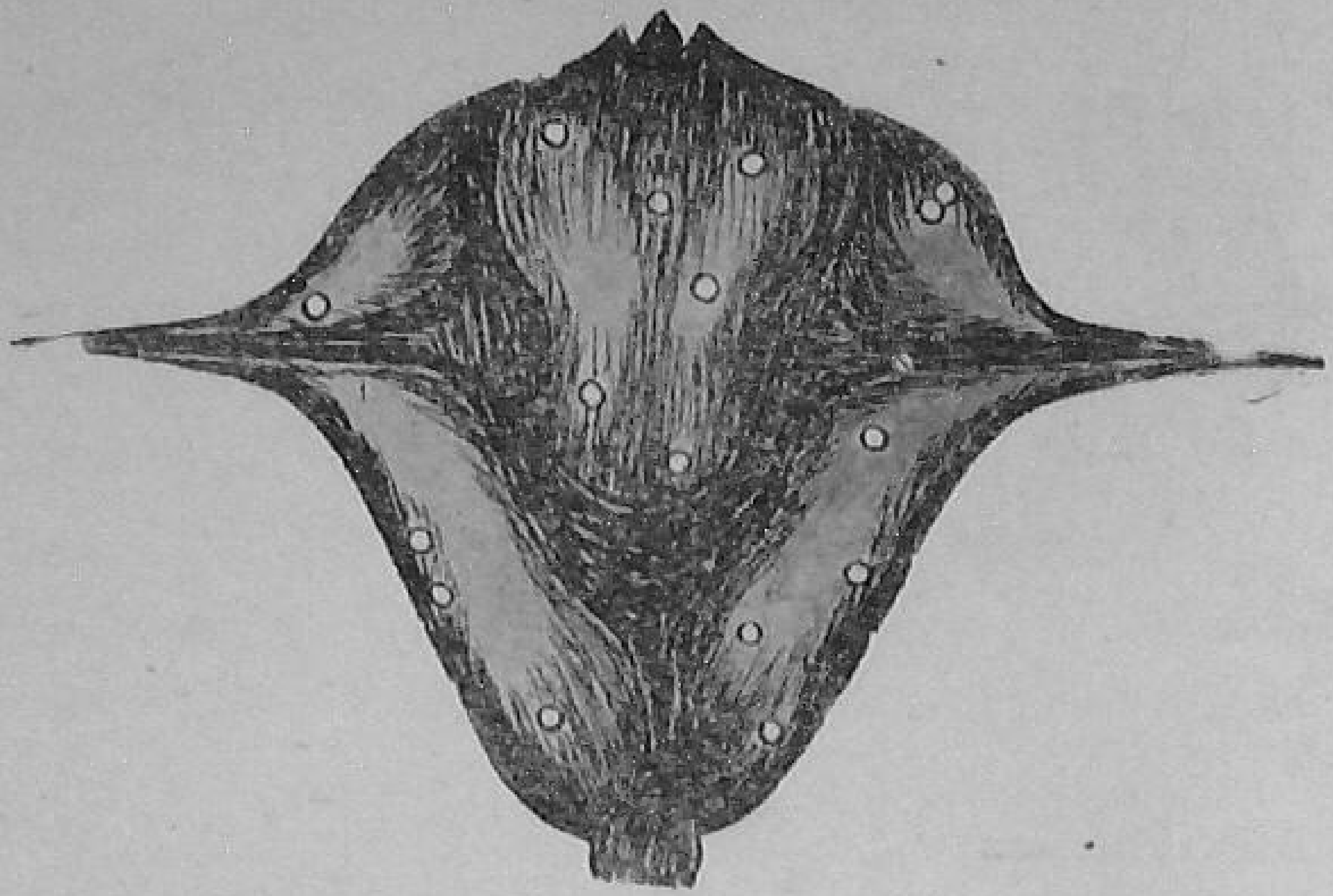
IN MAN

A single person may harbour as many as 1,000 worms. A few may occasionally be passed out in the stools, where they can be readily spotted by their size, bright red colour and movements. In Assam, these parasites are called *soothy*.

The worms, lying firmly attached to the lining of the intestines, leave deep imprints by the prolonged contact of their body parts. This may occasionally result in the formation of ulcers at the sites of attachment ; the gut lining becomes swollen and may even bleed at the ulcerated portions. There is abdominal discomfort, diarrhoea and anaemia. In later stages, swellings appear on the hands, feet, belly and the face. Untreated patients may ultimately die of extreme exhaustion. However, correct diagnosis and suitable medication result in a complete evacuation of the worms, and the symptoms disappear quickly.

SOURCES OF INFECTION

Ponds and water-beds where aquatic vegetables are cultivated are often fertilized with human night-soil ; this leads to the contamination of the water with the eggs of these flukes. The defecation practices of our people are another source of contamination. Pigs, too, while feeding around, may contaminate the water with their egg-laden droppings. Since snails feed and breed on such vegetation, the edible fruits and tubers of which get heavily infected with the cysts, ideal conditions are thus provided for perpetuating these parasites among pigs and men.



A *singhara* with a few cysts on it

Though all the parasites infest the pig also, in which they are often found in large numbers, they do not bring about any marked symptoms in the latter. The pig is evidently the natural host of these flukes and acts like a reservoir for them, while man gets involved occasionally and serves as an additional host. These parasites, however, have the same pattern of life-cycle both in man and pig.

HOW TO CONTROL

The intimate relationships to human infections of the fluke parasites encountered in pigs and the role of pigs as reservoir hosts necessitate measures for controlling the infections.

After conducting surveys, the localities where the flukes are endemic should be marked out and human cases diagnosed and treated. A suitable programme for disposal of night-soil with a view to killing the eggs should be adopted, and only night-soil treated with lime, etc., should be used as fertilizer for aquatic vegetation.

The cultivated areas, namely, ponds and water-beds, should be made inaccessible to pigs. The water-snails have to be destroyed with moluscicides which are not injurious to useful aquatic plants and fishes. Farmers should take the advice of veterinarians for deworming their pigs, and adopt suitable animal husbandry practices, management, feeding, etc. The garbage fed to these animals must be properly cooked, and in no case should the water-plants be given to them. Finally, all aquatic fruits and vegetables meant for human consumption must be either cooked or at least immersed in boiling water before use.

BAYER

DIPTEREX

(50% Emulsion)

★ Good Penetrating Action

★ Wide Range Effectiveness.

★ Non-Tainting.

★ No Residue Problem.

★ Low mammalian Toxicity

A new organophosphorous insecticide from the laboratories of

Farbenfabriken Bayer A.G.,
LEVERKUSEN

★

SHORTLY AVAILABLE

PROCESSED IN INDIA BY:
Bayer-Agrochem (Pvt.) Limited,
BOMBAY

***

TECHNICAL DETAILS FROM

Sole Distributors :
CHIKA Private LTD.
Bombay, Calcutta, Delhi, Madras

BAYER

Waste Straw Helps Cotton Use Nitrogen Better

by

P.S. Gupta *and* **R.P. Sharma**

COTTON is a good money-spinner, responding well to nitrogen application. But make sure that the nitrogen you apply is well utilized by the crop; otherwise, the money spent on the fertilizer is likely to be a total loss.

Nitrogen is lost from the soil faster than any other of the nutrients. Much of this valuable plant-food is leached down. For instance, it has been found in Uttar Pradesh that the maximum yields of cotton, obtained with the optimum dose of 45 pounds nitrogen as ammonium sulphate applied in two instalments at the early flowering stages, fell far short of the desirable figure. Nor could they be raised by application of additional doses of nitrogen. Obviously, much of this valuable food material is lost in the soil and even the additional nitrogen is not available to the plants. Thus, the factors responsible for increasing the nitrogen availability or enabling its better utilization by the plant are as important as the quantity of nitrogen applied.

Observations at the Cotton Research Station, Raya, in Mathura district, show that by applying cellulose in the form of straw along with ammonium sulphate, more nitrogen can be made available to the crop—bringing in a net additional profit of Rs. 34 per acre.

In the trials, which were conducted during the two cotton seasons 1957 and 1958, cellulose was used to determine the availability of nitrogen from the optimum dose of sulphate of ammonia. Waste straw, for cellulose, was applied at two tons per acre before the presowing irrigation. The variety used was Punjab American cotton *216F*. The increase in the availability of nitrogen was judged by the increase in *kapas* yield.

The yield average for the two years showed that application of sulphate of ammonia alone, at 45 pounds N per acre, increased the average yield of *kapas* (816 pounds) by 24 per cent over control (630 pounds, untreated). But with two tons per acre of waste straw and the same quantity of sulphate of ammonia, the average yield of *kapas*, i.e., 946 pounds, rose by 52 per cent over control, giving an additional yield of 28 per cent.

The economics of the trial is given below.

	Waste straw at 2 tons per acre + amm. sulphate at 2 cwt. per acre	Amm. sulphate at 2 cwt. per acre	Control (untreated)
Average yield of *kapas* per acre in lb. (for 1957 and '58)	946	816	630
Cost of *kapas* at Rs. 30 per md. (82 lb.)	Rs. 346	Rs. 298	Rs. 230
Profit over control	Rs. 116	Rs. 68	—
Net profit over control after deducting Rs. 14 as the cost of 2 tons of waste straw at Rs. 7 per ton	Rs. 102		
Net profit by use of straw	Rs. 34		

It is evident from the increase in yield that the plants are able to utilize more nitrogen from sulphate of ammonia if the latter is applied in the presence of cellulosic matter in the soil.

ALGAE SYMPOSIUM

An International Symposium on Algae will be held at New Delhi from December 7 to 13 1959, under the joint auspices of the Indian Council of Agricultural Research, Union Ministry of Food and Agriculture, and the United Nations Educational, Scientific and Cultural Organisation. An exhibition of algae, both fresh-water and marine, will also be held at the Indian Agricultural Research Institute, on the occasion.

CORIANDER IS M.P.'s DOLLAR-EARNER

by
B.G. Nikam
F.K. Pawar
and
S.N. Kulkarni

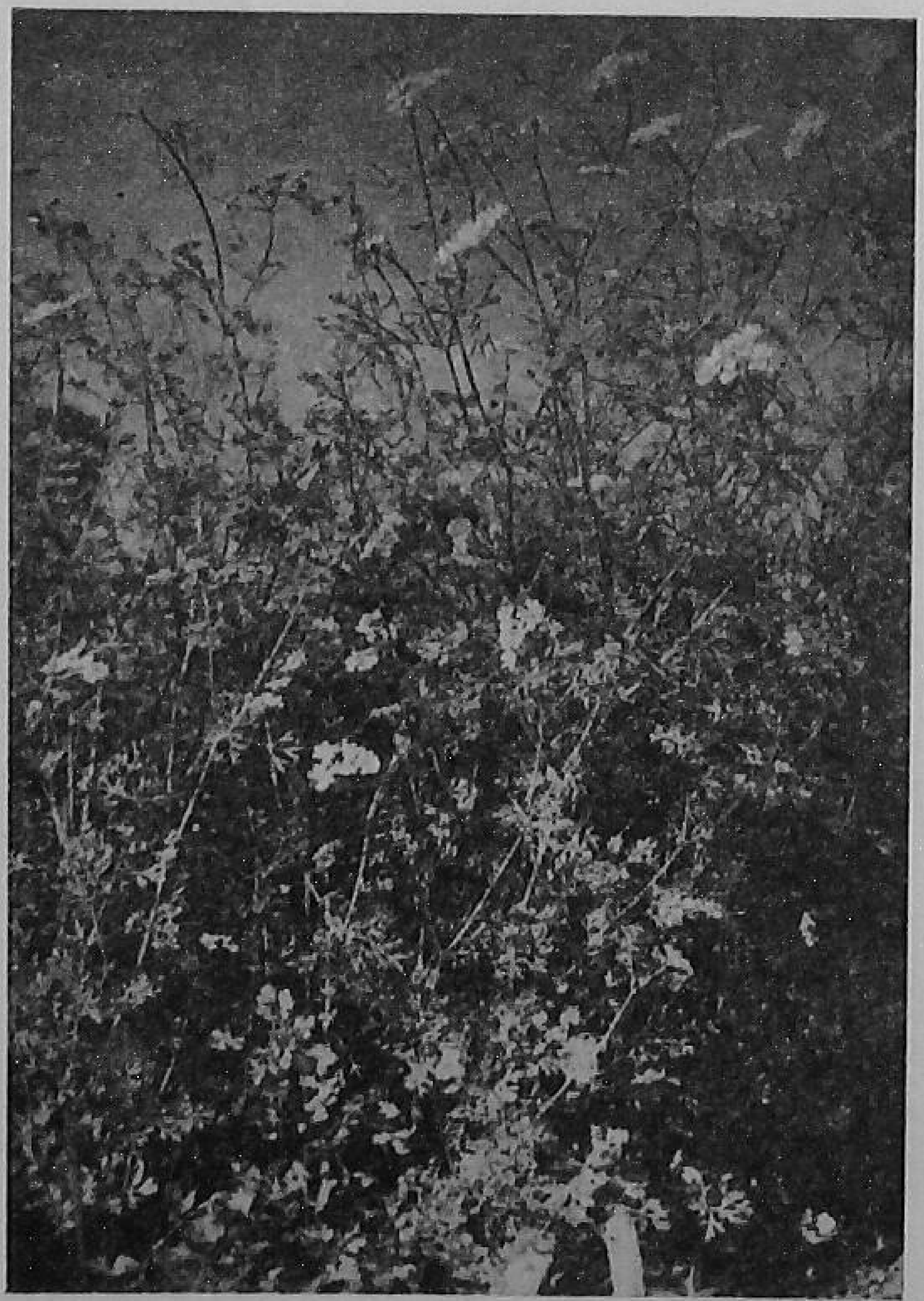
IN coriander, Madhya Pradesh has a great dollar-earner. The district Guna alone exports an annual 80,000 maunds of coriander seed valued at six to eight lakh dollars, mostly to the U.S.A., where essential oil is distilled from it.

A good crop of coriander yields as much as 800 to 1,200 pounds of seed per acre, bringing in an annual Rs. 400 to 600.

Botanically *Coriandrum sativum*, coriander belongs to the natural order Umbelliferae. It has an ancient history, its seeds having been found in Egyptian tombs of the tenth century B. C. It is now cultivated largely in India, Burma, Turkey, Palestine, Russia, the Balkan countries and in North Africa, principally Morocco.

Two different types of coriander are cultivated—one with a light purple-bluish stem and purple-bluish flowers, and the other with a light yellowish stem with white flowers. There are also two types of coriander seed, one small and the other big or bold; the small-seed type is more aromatic and fetches a better price in the market.

Coriander in the field



The plant has a strong odour like that of the bed bug. The word coriander is derived from the Greek word *koris* meaning bug.

In India, coriander is cultivated on a field scale for seed purposes and on a small scale for its green leaves and stems. Coriander seed, as well as the leaves and the stem, is used as a spice in cooking. Coriander oil, which is distilled from the seed, is used in industry. The seeds have valuable medicinal properties. In Gujarat and Saurashtra, husked coriander seeds lightly coated with turmeric powder and salt are chewed after meals.

In India, coriander is mostly grown in the black cotton soil tracts, where it thrives. It occupies 1,20,700 acres in Madhya Pradesh, 64,700 acres in Bombay, 12,600 acres in Mysore and 10,000 acres in Bihar.

In Madhya Pradesh, where it is called *dhana*, coriander is grown in almost all districts of the State, mostly in Durg (24,932 acres), Dhar (24,650 acres), Ujjain (19,688 acres), Bilaspur (11,536 acres), Ratlam (7,162 acres) and Guna (4,435 acres). Large quantities of seed are exported every year from this State. The coriander of Guna district has a reputation of its own in Bombay, Rajasthan and other markets of India, and is sold as "Guna" quality coriander.

The black cotton soils of Malwa, the heavy black clayey soils of the Narbada valley and the heavy and light Indo-gangetic alluvial soils of northern Madhya Pradesh are roughly the coriander areas in Madhya Pradesh.

CULTIVATION

The *kharif* crop is sown in the months of August and September, in the Malwa region, and the *rabi* crop in the months of October, November and December in other parts of the State. In some districts like Guna, Sagar and Gwalior, the *rabi* crop is grown under irrigation.

In the *kharif* season, coriander is rotated with groundnut, and in the *rabi* season, with wheat, linseed or gram. But when grown as an irrigated *rabi* crop, it is grown after maize or rice.

Preparation of the soil is simple: two ploughings followed by one or two harrowings. In black cotton soils, little or no manure is used, but in lighter soils, 15 to 20 cartloads of farmyard manure per acre are added.

The seed for sowing is trampled or rubbed gently to split it into halves. Germination takes ten to 12 days, and longer if the seed is sown whole. Twelve to 16 pounds are required per acre.

Coriander is sown either broadcast or drilled. To facilitate watering, beds of 6 feet × 6 feet are prepared after broadcasting. The general practice is to drill the seed through a drill-tube tied behind the plough, in rows nine to 12 inches apart. When the plants have sprouted and are well above the ground, the crop is intercultured once or twice with a hoe. In the irrigated crop, three to four interculturings are given by hand.

The plants flower in about two months from sowing. The seeds set in 15 days from flowering. A month later, the crop is ready for harvest. The plants are either pulled out by the roots or cut with a sickle and then stacked on the threshing floor. Threshing is by beating with sticks. The seeds are sieved, winnowed and dried in the sun before storing.

ECONOMICS

The following figures give some idea of the outlay per acre of the crop.

Dry

	Rupees
Two ploughings	24.00
Two harrowings	6.00
Seed	8.00
Manure (20 cartloads)	40.00
Two interculturings	6.00
Harvesting	8.00
Threshing	8.00
Land revenue	3.40
Total	103 00

Irrigated

In addition to the above, expenditure is incurred on the following extra items	103.00
Four hand interculturings	16.00
Four waterings	64.00
Total	183.00

The crop gives an approximate net profit of Rs. 300 to Rs. 400 per acre.

* * *

WHAT NUTS MEAN TO YOU

It is said that nuts contain the most concentrated form of nutrients of all known food substances. Within the confines of a hermetically sealed capsule or shell can be found the choicest aggregation of materials essential for the building and maintaining of sound bodies and robust, continued health.

The protein of nuts is far superior to that of vegetables or meat in all round quality.

In nuts, there is no waste nor any tissue spoilers. They are free from rot-inducing bacteria and are aseptic. They are not readily subject to decay—either when eaten or before being eaten.

A pound of nuts contains almost as much albumin as two pounds of beef-steak. Most nuts contain 50 per cent or more of an absolutely pure and readily digestive fat—not the kind that builds up cholesterol blood serum content in the body.

When you consider that fats and albumin are the two most essential food substances, you can realize how important nuts are in the diet. As blood-builders they are unexcelled.

mites too are big thieves of crops

by
J. G. Pawar
College of Agriculture, Indore
and
V. S. Rathore
Division of Entomology, Gwalior

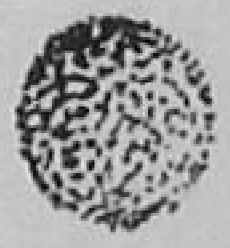
APART from insect pests of crops, there are also some non-insect pests, viz., mites, which are posing a serious problem to the agricultural entomologist.

Zool-gically, these phytophagous (feeding on plants) mites belong to the phylum Arthropoda, class Arachnida and order Acarina. One group of predaceous mites preys upon other insect pests and thus keeps them in check. Another group, the phytophagous mites, feeds upon crops, causing reduction in yield. What's worse, they are polyphagous : a single species of a mite is known to feed on a number of plants of economic importance. Many crops like sugarcane, cotton, vegetables, fruit trees, etc., are damaged by a number of species of mites.

Like the sucking insects, the mites desap the leaves with their stylets (piercing organs) and deprive them of chlorophyll (the plant pigment concerned with food manufacture), thereby lowering the vitality of the plants. In addition, they feed upon many weeds and ornamentals. They attack the underside of leaves, spinning a web which hinders the proper functioning of the leaves. It is in these webs that the oviposition (egg-laying) and the growth of the progeny take place. The damage is at its peak during summer.

GENERAL BIOLOGY

The adult female mite is bigger than the male. Unlike insects, mites have one larval and two nymphal stages, the former having three pairs of legs and being smaller in size than the latter, which have four pairs of legs. The adults also have four pairs of legs. Most species pass through the following stadia (stages) during their life-history: egg ; active larva - quiescent larva ; protonymph - quiescent protonymph ; deutonymph - quiescent deutonymph and adult. The deutonymph stage is usually lacking in the males.



The egg

The male emerges earlier than the female, seeks out the resting female deutonymph, fertilizes it as soon as it emerges, and dies. Parthenogenesis (development without fertilization) is also common ; the resulting progeny are nearly all males. The mites are very active in May-June and September. All stages but the eggs are destroyed by the rains, and only gravid females and eggs overwint r. The complete life-cycle takes about two weeks, but varies with the season.

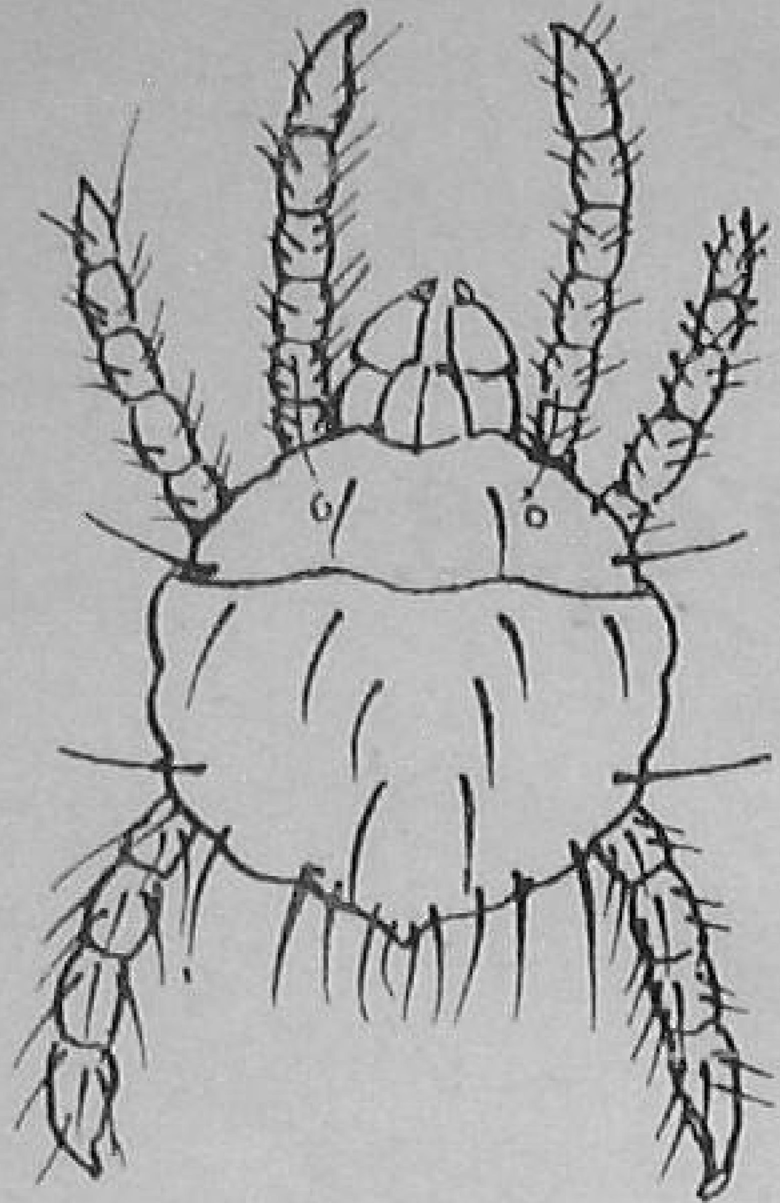
Dispersal takes place when the females migrate to neighbouring plants either through the contact of the leaves, or are carried by the gusts of wind.

Described below are some mites of agricultural importance. *Paratetranychus indicus*, *P. citri*, *Tetranychus cucurbitae*, *T. equatorius* and *T. telarius* belong to the family Tetranychidae. *Eriophyes gossypii* belongs to the family Eriophiidae.

PARATETRANYCHUS INDICUS

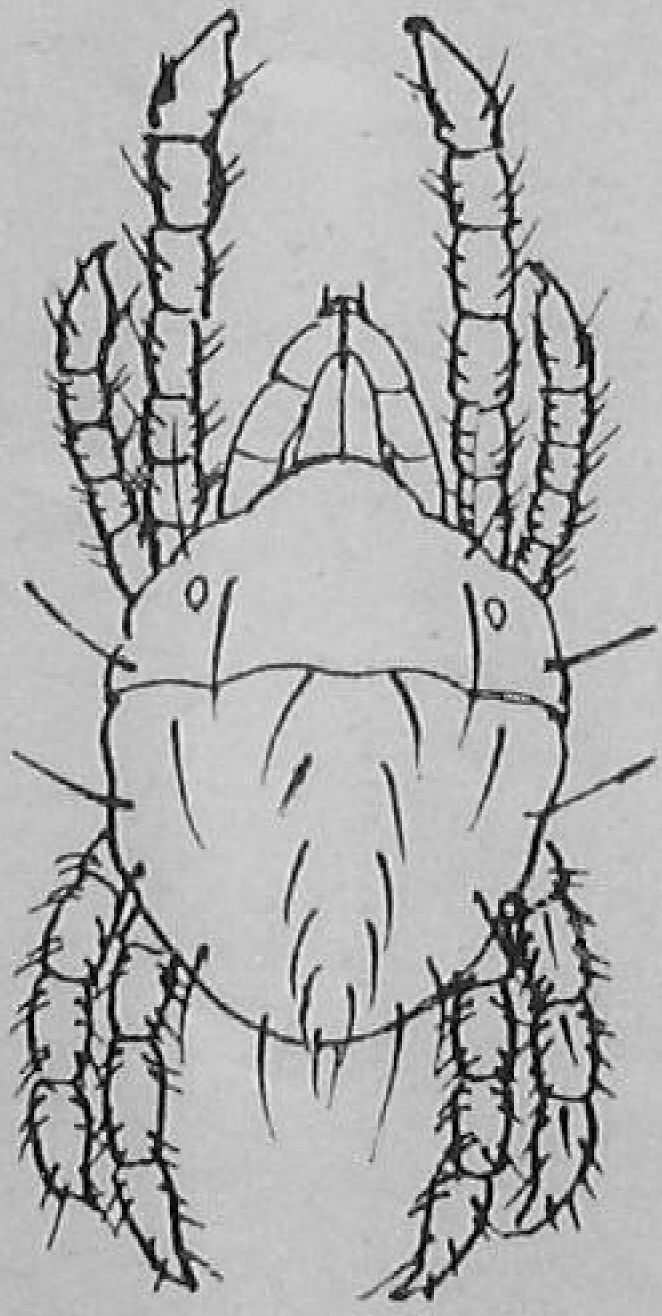
This mite is a serious pest of *jowar* and sugarcane.

Damage. In sugarcane, the infested leaves turn red and in some cases gradually straw-coloured from the tip downwards. They later dry up and fall off. The foliage is webbed all over. Finally, the growth of the canes is arrested. The soft-leaved varieties of sugarcane have been found more susceptible than those with hard and tough leaves.



Larva

In *jowar*, the attacked leaves turn bright red. The leaves and stalks get dried. The damage is the greatest if young plants are attacked. The development of the cobs and grains is checked, but if the infestation takes place after cob formation, the development of grains is not much affected.



Female protonymph

P. indicus is active from mid-April to September. The female lays spherical, dirty white eggs of 0.115 millimetre diameter from the end of February to November, and soon dies. The pre-oviposition, oviposition and post-oviposition periods take one to two, 9½ to 14½ and one to three days, respectively. The eggs later turn brownish, become transparent along the sides and show red eye-spots. In 2½ to three days, they hatch out into 0.147 to 0.210 millimetre-long larvae which are spherical and light amber-coloured when fresh; they are elongated and greenish later.

The male protonymph is 0.214 millimetre long and is wedge-shaped, while the female is 0.220 millimetre long and is rounded. The greyish-green deutonymph turns green afterwards. The male larval plus nymphal period lasts 1½ to three days, while the female larval and nymphal period occupies three to five days. The adult male is 0.236 to 0.294 millimetre in length and 0.183 to 0.196 in width, and without blotches on the back; the female is 0.281 to 0.343 millimetre in length and 0.200 to 0.247 in width, and has large blotches. The life-cycle varies from 12½ to 17 days. During the active period, the life-cycles of the male and female are completed in 4½ to six and 5½ to seven days, respectively. Thirty overlapping generations in a year have been recorded under controlled conditions. Parthenogenesis is also common.

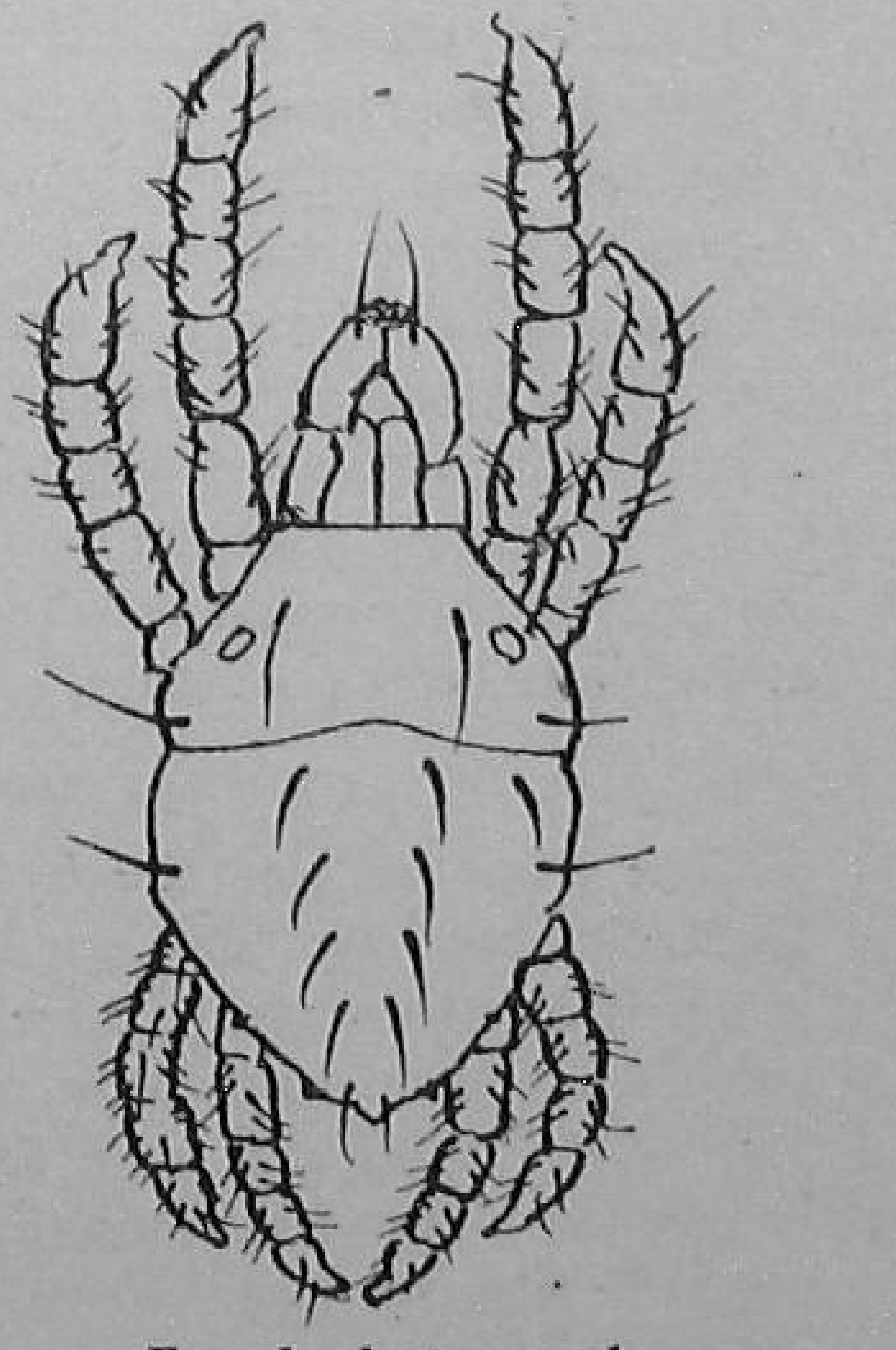
P. CITRI

P. citri attacks the leaves, tender fruits and green bark of citrus, grapes and pomelo. The infested parts do not develop properly, and fall off prematurely.

The female mite, two days after emergence, lays about 50 eggs, which hatch in one to four days. The larval, protonymphal and deutonymphal periods occupy three to four, three to four and four to five days, respectively. The adults live for five, or slightly more, days. Several overlapping generations are produced from March to November.

TETRANYCHUS CUCURBITAE

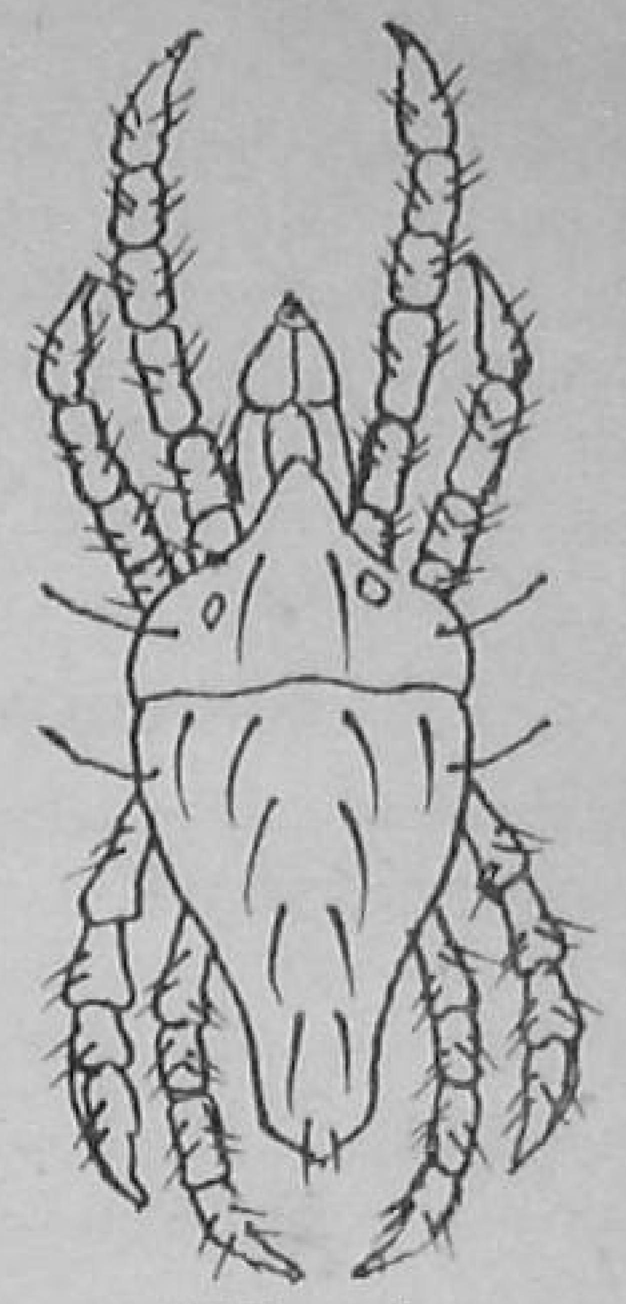
T. cucurbitae is a serious pest of vegetables. Among its hosts plants, the most important are brinjal, cabbage, cauliflower, knolkhol, gourd, *loki*, tomato, *desi sem* (*Canavalia ensiformis*), peas, *mung* (*Phaseolus* sp.), *arhar* (*Cajanus cajan*), potato, radish, turnip, lady's finger, soyabean, cowpea, sweet potato, *tinda* (*Citrullus vulgaris* var. *fistulosus*), *karela* (*Momordica charantia*), lucerne, berseem, onion, cotton, sannhemp, melon, water-melon, citrus and mulberry.



Female deutonymph

The "desapped" leaves show white dots, which gradually merge to form large patches ; they etiolate (fade), wilt, dry and fall off. In most cases, the attacked plants do not bear any fruit. In some hosts, e.g., *desi sem,* the affected leaves become rust-red in colour. The leaves are covered all over by the webs during May and June.

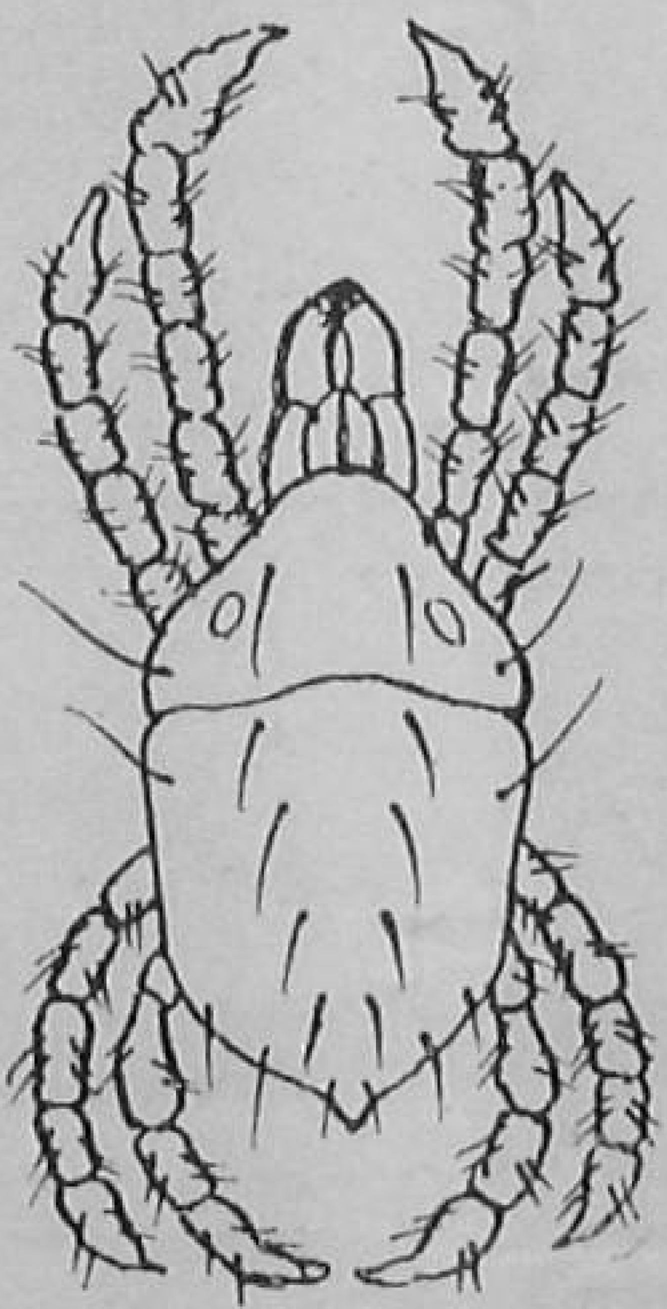
The spherical, translucent eggs (later changing in appearance as in *P. indicus*) are 0.112 millimetre in diameter, and are laid at random on the underside of leaves from the beginning of March to mid-December. The 0.140 to 0.196 millimetre larva resembles in colour that of *P. indicus*. The male protonymph is elongated, while the female one is ovate in shape. During the active period (April to September), the oviposition and hatching periods last eight to ten and three days, respectively. The females die soon after oviposition. The duration of the life-cycle of *T. cucurbitae* during the active period is four to 8½ days in the case of the males and five to ten days in females. The fecundity (fertility percentage) is 61 to 93 in mated and 33 to 59 in unmated (parthenogenetic) females. Thirty-two overlapping generations have been found per year under controlled conditions.



Adult male

T. EQUATORIUS

Among the 38 hosts attacked by *T. equatorius* are brinjal, soyabean, urid (*Phaseolus* sp.), papaya, mango and cotton and *Gladiolus* sp.—an ornamental plant.

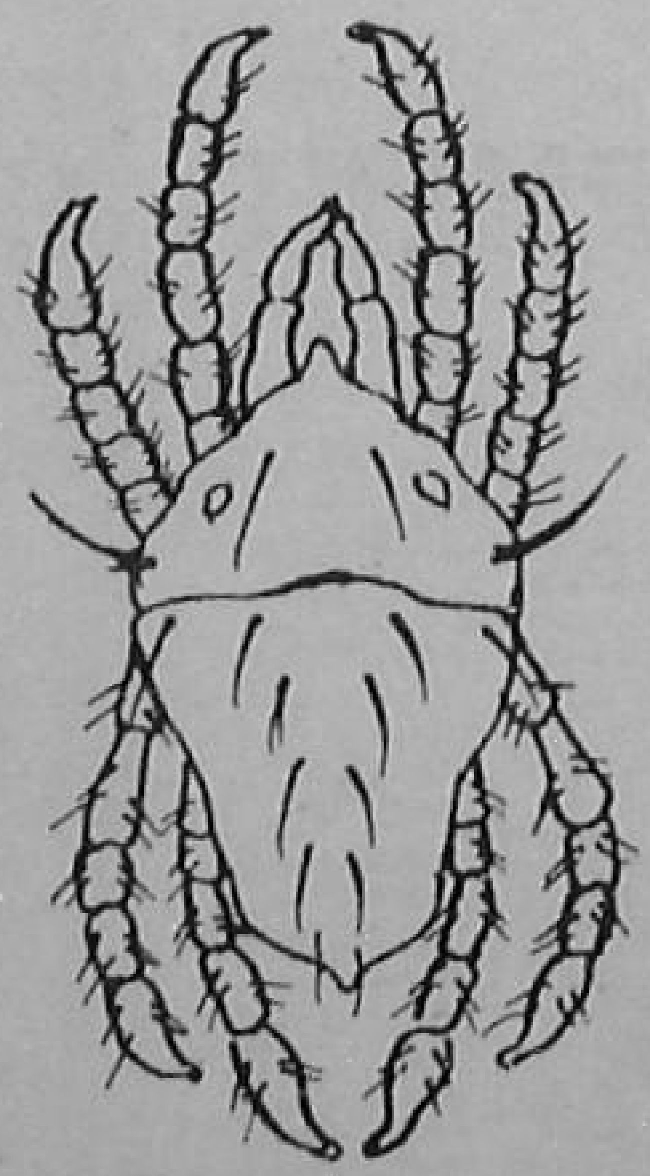


Adult female

The infestation is on the underside of leaves; in *jowar, bajra,* red pumpkin and ridge gourd, it is on the upper side. Damage is the same as caused by *T. cucurbitae.*

The eggs are spherical and faint yellow, later turning brownish or blackish. The larva is spherical and yellow to green in colour with black spots on the back.

The green (later yellow) and oblong protonymph has dark patches on its back. The yellow deutonymph becomes amber coloured later. It is only in this mite that the male usually undergoes the deutonymphal stage ; the male deutonymph is pale yellow and the female deep pink. The adult male (0.298 to 0.333 millimetre long) is yellow in colour with dark spots on the back, and the female (0.451 to 0.536 millimetre) is deep pink. The pre-oviposition, post-oviposition, egg, larval, protonymphal, deutonymphal, adult male and adult female periods last for one to two, one to three, three to nine, two to five, three to four, two to five, eight to 12 and six to 28 days, respectively. The average fecundity is 37.



Male protonymph

T. TELARIUS

T. telarius mite is a serious pest of cotton, and also feeds on castor, sannhemp, tomato, etc. It attacks the leaves and flowers of sannhemp. Under a severe attack, the yield is greatly reduced.

ERIOPHYES GOSSYPII

E. gossypii imparts an ash-like colour to the infested leaves of cotton, hence its common name "cotton wooly mite". The affected leaves remain stunted and curl up. This mite usually lives under the tissues of the epidermis (surface layer) of the leaves and causes a growth of dense whitish hairs. *E. gossypii* spreads during the drought year and checks the vigorous growth of the plants.

CONTROL MEASURES

Mechanical. The affected leaves should be immediately removed. Proper care must be taken to eradicate the alternate host plants to prevent their breeding during the off-season.

Chemical. 1. Dusting with finely powdered sulphur alone or mixed with wood ash or road-dust (1 : 4) is useful.

2. Spraying with a pound of fish-oil rosin soap in six gallons of water kills the mites.

3. Applying lime-sulphute of 18 per cent sulphur content. One part of a sulphated organic compound added to 2,600 parts of lime-sulphur will serve as an ovicide, too. The limitations of the lime-sulphur spray are : it is readily washed away by rain ; it does not reach the underside of leaves where the mites live ; and it has a short residual effect.

4. Modern insecticides like "Rhodiatox", "Toxaphene" and BHC have been found to be better miticides.

5. "Schradan" (octamethylpyrophosphoramide) 0.3 per cent and 0.5 per cent, a systemic insecticide, has been found very effective, especially the latter strength.

6. More recently, 0.02 per cent "Folidol" has proved to be the best acaricide.

Great care is necessary in handling these chemicals. It is desirable, therefore, that the local plant protection officer is consulted before using them.

Manufacture of aureomycin is carried on under the most hygienic conditions. Here, we see wetted and sterilized barley groats being inoculated with chlortetracycline vaccine.

CZECH CO-OPERATION GETS A RENOVATION

IN Czechoslovakia, the co-operative movement among farmers has developed to such an extent that 77 per cent of the agricultural land is cultivated on a co-operative basis. Co-operative farms now exist in 81 per cent of Czech villages. The average size of a co-operative farm has increased to 353 hectares.

Until recently, co-operative farms were generally of small acreage. These produced a wide range of farm produce on a small scale. But now, specialization of co-operative farm output, division of production programmes among individual co-operative farms and their mutual co-operation are being tackled on a broad scale.

It is, for example, not necessary for every co-operative farm to breed pigs and also fatten them for marketing; while one co-op specializes in breeding them, a neighbouring one acts as a fast pig-feeding station. The distribution of cash crops, such as flax, rape, poppy and others (grown approximately on 7.5 per cent of arable land) in large continuous acreages, according to the specialization of individual co-operatives, will make it possible to use farm machinery more economically

A demonstration showing the advantage of divided harvesting. The standing corn is mowed down first, and after drying, is gathered in by a combine or silo-cutter

of the overall figures of the State plan for their particular district, discuss with co-operative farmers only the delivery of the most basic market products, such as sugarbeet, bread grains, oilseeds, meat, etc. Delivery quotas will no longer be fixed for individual co-operative farms. The deliveries will be ensured by agreement and individual co-operative farms will draft their own yearly production plan according to this agreement. Mutually binding contracts between co-operative farms and the State purchasing agency will be concluded on the basis of these agreements. The contracts will determine the deliveries of foodstuffs and agricultural raw materials in the required quantities. Harmony between the production of co-operatives and the

Co-operatives and State farms use highly efficient machinery to drain the soil

—particularly combines, and to lower harvesting losses. The same principles may also be applied in vegetable growing.

Co-operative farms will also co-operate on an extensive scale in capital construction and in related production. The experiences of the Jicin district show, for example, that the joining up of small building teams of several co-operative farms into a larger unit is very effective since it speeds up and makes the construction of farm buildings cheaper. These combined building teams after completing a certain job at one co-op will move on to another. They will also be able to exploit jointly the local resources of building materials by making use of local sandpits, quarries, etc. This type of co-operation by various co-operative farms will also be applied in drainage work, in the purchase and utilization of special facilities, such as artificial chicken-breeding plants, in the construction of local lanes or in the industrial processing of feedstuffs. This type of co-operation will be particularly important in cattle-rearing on pasture land of low-lying and highland farms.

EXPANDING FARM OUTPUT

The problem now is to expand large-scale farm output. Large-scale production will require changes in the planning of farm output and in the system of state purchases of agrarian produce. The new measures taken in this respect in Czech agriculture greatly simplify existing practices. Detailed output and delivery tasks will no longer be laid down for every farm. In future, district officials will, on the basis

requirements of the State plan will be ensured by this simple co-operation.

NO DOUBLE PRICES

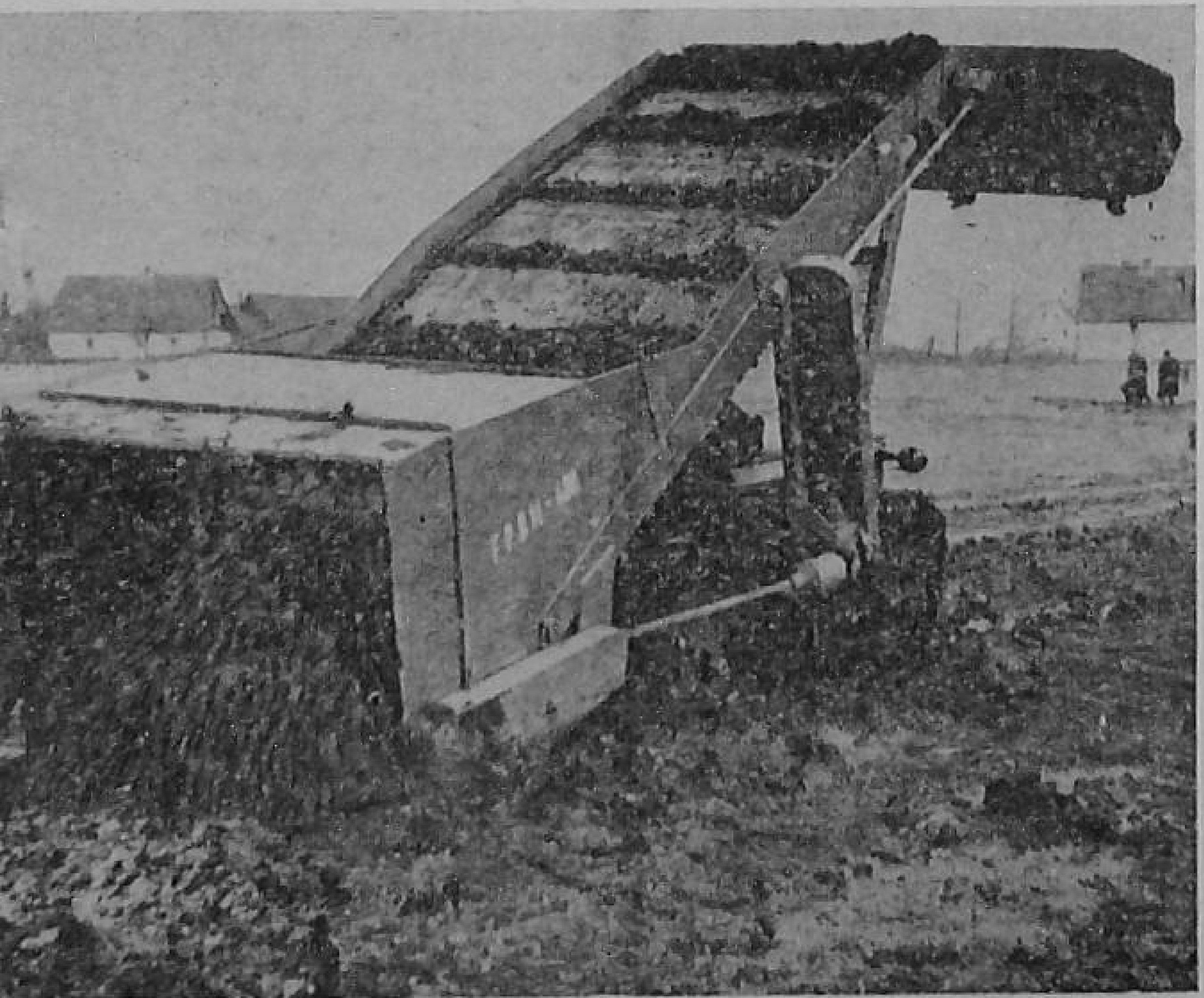
In this new situation, compulsory deliveries will be abolished, as well as the present system of two prices for the purchase of agrarian produce—the lower price for the compulsory deliveries, the higher price for deliveries above the quota. This double-price system played an important part in the period of collectivization and the consolidation of young co-operatives. In recent years, however, certain unfavourable consequences of this system have become apparent. For example, this system did not sufficiently encourage weaker co-operatives to expand their production and failed to prevent disproportionate swings in earnings between years of good and bad

harvests. The system was also very complicated and required the maintenance of a considerable administrative staff.

The new single prices of farm products will be fixed according to the average production costs of individual products; however, they will also ensure for co-operatives the funds for expanding and improving their output. Differential production costs of individual farm products resulting from different producing conditions will be balanced by a graded farm tax.

Conditions are now being created for maximizing the efficiency of farming and to introduce a consistent mechanization of farm operations. Agricultural production is to be raised by 1965 by 40 per cent against its real volume in 1957, while productivity of labour is to be increased by two-thirds. Crop output is to increase by 47 per cent, and livestock output by 32 per cent. The percentage of fodder crops on arable land, particularly of lucerne, clover and silage maize, is expected to increase from 26 per cent to 30 per cent. The essential imports of wheat, particularly from the Soviet Union, will increase proportionately. In this way, the output of basic livestock products will considerably increase while making every co-operative and State farm self-sufficient in the output of fodder to the greatest possible degree. By 1965, a high degree of general self-sufficiency in food should thus be achieved.

Fertilization of meadow land



RAISING SOIL FERTILITY

Raising the fertility of the soil will be of key importance for attaining such a rapid and substantial increase in farm output by 1965. In the first place, extensive drainage operations will have to be carried out on some 200,000 hectares of land. Irrigation construction work will have to be carried out on approximately 70,000 hectares. Capital investments in land will amount to 4,400 million crowns in the course of the Third Five-Year Plan (1961-1965). The State will support co-operative farms strongly in this activity and carry out the regulation of waterways of a total length of 1,300 kilometres. A number of other measures will also be taken to increase soil fertility. In their sum total, these measures will result in entirely new systems, based on natural conditions, of farm output in individual producing areas. New large-scale production technology will also play a vital part in livestock output.

TRACTOR STATIONS

The average land-holdings of co-operative farms have increased to such an extent that farm machinery can now be fully exploited. The financial resources of co-operative farms are also large enough now to enable them to purchase farm machinery without lowering the living standards of co-operative farmers. The transfer of the ownership of farm machinery from State tractor stations to the co-operative farms will also considerably influence the lowering of production costs and increasing labour productivity. Tractor stations will, however, continue to be an important aid to co-operative farmers. They will carry out work involving the use of heavy machinery, for example, in drainage operations. In addition, they will be re-organized into repair centres, and the training of farm machinery specialists for co-operative farms will be concentrated there. The deliveries of 110,000 new tractors and 11,000 grain combines, in addition to many other farm machines, by 1965, will help introduce large-scale production technology on co-operative farms. Together with the existing 50,000 combines, they will form the basis for a gradual complex mechanization of all farm operations.

The living standards of co-operative farmers in Czechoslovakia are fairly high. Throughout the countryside, people are buying modern furniture, putting up new houses or modernizing existing cottages, adding bathrooms and garages for their private cars. More than one-third of co-operative families now own a motor vehicle.

The expected rise in farm output, it is hoped, will place Czechoslovakia sixth among European countries in volume of farm output and third in per capita output.

A Conference on Hybrid Maize was held at the Indian Agricultural Research Institute, New Delhi, from September 28 to October 3, 1959. Picture shows Dr. Panjabrao Deshmukh inaugurating the conference.

NEWS and PICTURES

Radio Farm Forums

As part of the drive to step up agricultural production, a network of Radio Farm Forums will begin working in all development blocks of the country from next month.

Under the scheme, forum programmes will be broadcast by All India Radio on agricultural and allied subjects, which will be selected by the Rural Advisory Committees of the A.I.R. Stations in consonance with the soil, climate and other conditions of the different regions. Later, the broadcasts will be taken up for free discussion by the members of each forum. The problems that come up, and their solutions, will be referred to agricultural experts for advice, and put on the air in the next week's programme. Simultaneously, a feature or talk on improved agricultural practices will also be broadcast.

Only such persons will be enrolled as members of the forums as would seriously take up the task of increasing agricultural production and would keep clear of village politics.

The scheme was born out of the success achieved under the Pilot Project Scheme organized in 150 villages in five districts of Bombay State with the assistance of the UNESCO.

—*A. S. Sharma*

Paddy Straw is Good For Paddy Crop

A trial at Daithakere, Hunsur taluk, has shown that paddy straw is a good manure for the paddy crop.

The trial was conducted during the summer of 1959. The type of soil is light clay. Two plots were selected, one receiving farmyard manure at five tons per acre and the other, paddy straw in the same quantity. The preliminary cultivation was done soon after the monsoon harvest of paddy when the soil was still wet. Just before transplanting, both the plots were given ammonium sulphate and superphosphate at 56 pounds each per acre. Urea at 28 pounds per acre was applied at the first weeding after about 23 days of transplanting.

The grain yields obtained from the two plots were: 1,350 pounds from the plot which was given the basic dose of paddy straw, and 1,225 pounds from the plot which was given farmyard manure.

—*Syed Nasiruddin*

Indian Control Measures Against Desert Locusts

A second generation of "hoppers" may appear in north-western India and Pakistan, says the latest forecast issued by the Anti-Locust Research Centre in London. Any escapes which may occur in these countries, the report goes on, will threaten Iran and eastern Arabia, and may give rise to winter breeding in the coastal areas of Iran and on the Oman peninsula.

This forecast, which is part of the London centre's most recent desert locust situation summary, notes that young swarms will probably continue to appear during late September and October in the Sudan and are also likely to form in northern Ethiopia. On the Arabian peninsula, young swarms will be forming in the Yemen and may also appear in the Aden Protectorates. Immature swarms from the western part of the summer breeding belt are likely to move into north-western Africa during October and November.

Describing the situation over the past weeks, the report notes that summer breeding on a moderate scale was occurring in north-western India and Pakistan during August and early September. In India, control was completed against hopper infestations in Bikaner district, but was continuing against hoppers and some fledglings in western Jodhpur, where further layings occurred in late August.

Several swarms were reported from Sind, Pakistan, during August and early September, and Bahawalpur in early September.

—*B. I. S.*

Farm Flashes

Dipping poultry birds in a solution of " Malathion " one per cent is a good way of keeping them free of ticks. The effect lasts for two weeks.

Poultry yards should be kept dry, otherwise they become a hotbed of infections. They should be sloping and have sandy porous soil to drain off rain-water.

Better have two yards for your poultry birds, with the poultry house placed in between with trap-doors on either side. Each yard should be used in alternate years, the fallow yard going under an annual crop or grass pasture ; the cultivation helps cleanse the soil.

Some plant protection tips : spray stems and roots when the ground is damp. If possible spray after, not before, irrigation. Dust stem and roots before irrigation. Do not dust or spray dry foliage in the middle of the day during hot dry periods.

Jowar smut can be completely controlled by treating the seed with finely powdered sulphur, one ounce for every 15 pounds of seed. Mix the powder well, so that the grains get a uniform coating. The treatment costs about two nP per acre.

Brown milk bottles, designed to trap vitamin C, are now being made by a Copenhagen factory to replace the conventional clear milk bottles. Danish scientists believe that sunlight on ordinary glass robs milk of 79 per cent of vitamin C, while the loss when brown glass milk bottles are used is only 1.3 per cent.

Seepage of water from farm ponds can be effectively stopped by common salt applied at $\frac{1}{10}$ to one pound per square foot. First, drain the pond and chisel the bottom. Then, use a fertilizer-spreader to apply salt in amounts recommended by the soil specialist, disc and cross-disc to work the salt in. Dampen the mixture with sprinklers, and then pack the pond bottom before permitting the pond to be refilled. Growth of fish in farm ponds also seems to improve from salt applications.

In Hawaii, they use paper as a soil mulch in pineapple cultivation. The mulch paper is laid down in strips before planting, by a machine which also deposits a ridge of soil over each side-edge of the paper. The mulch paper helps control weeds as well as conserve moisture. It is marked at the time of manufacture to show the proper plant spacing.

Adding lime to acid soils not only corrects acidity, but improves the soil tilth and increases the moisture-holding capacity of the soil. Phosphates locked up by acid slowly become available. Potash and nitrogen slowly become more active. All this takes time. So, apply the lime from three to six months ahead of planting.

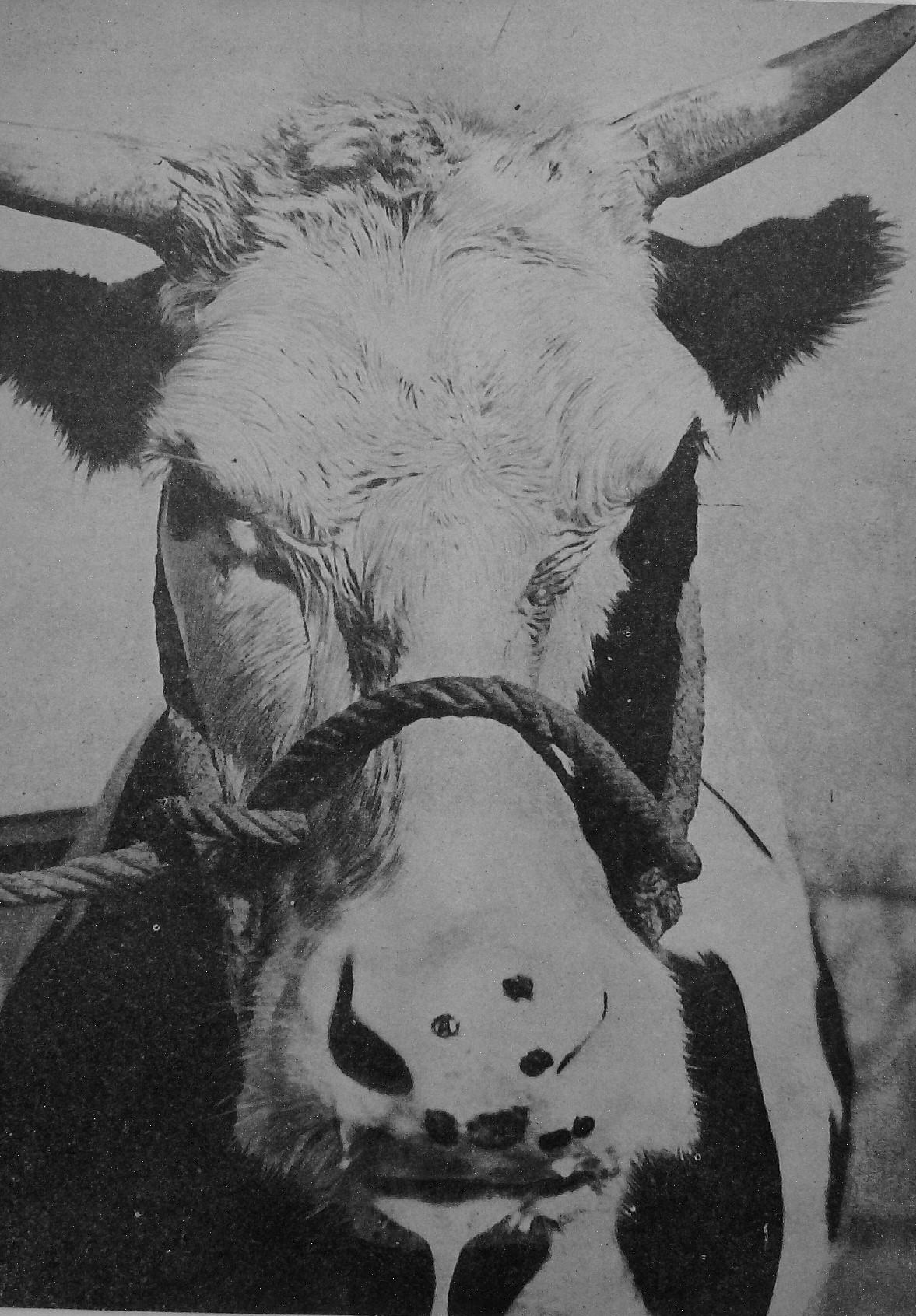
Tranquillizers are proving useful in cutting shrink, in hauling cattle and making them easier to handle and adjust to new conditions. Injection gives better results than feeding. A special gun that shoots darts containing a tranquillizer has been developed.

Fertilizing your fish pond may well step up fish production. Apart from increasing fish food, it suppresses weed growth by stimulating the growth of tiny plants and animals that shut out the sunlight essential for weeds. However, if the pond is badly infested with weeds, it is a sound practice to kill them with 2,4-D or some other weedicide before applying fertilizer.

When your cow chews her food very slowly and runs the mouth when chewing the cud, better check her mouth. A sore mouth or a bad tooth may be the cause. When shedding their teeth, animals sometimes have one that is painful when chewing. Irregular teeth will cut the jaw or tongue. Your vet can extract or file down broken or irregular teeth.

Of late, urea is being included in cattle feeds in substantial amounts. Cattle, sheep and goats are the only animals that can use urea efficiently. The nitrogen of urea is converted into protein ; one pound of urea is equal to six pounds of cottonseed or soyabean oilmeal.

Build ant-proof stands for your beehives, if you live in an ant-infested area. A frame made from metal pipe about 15 inches high is ideal. Mix " Chlordane" with heavy oil or cup grease and put it on pipe legs near the ground.



How They're Fighting Contagious Diseases Of Animals

by
Sir Thomas Dalling
Consultant of the F.A.O., Rome, Italy

ALTHOUGH the words "infectious" and "contagious" when applied to disease are often thought to have the same meaning, there is a distinct difference. An infectious disease is actually caused by some specific agent and the condition set up by that agent is termed an "infection". Now, if that agent can be transmitted from the infected animal to other susceptible animals which, in their turn, develop the same condition, the disease produced is termed a "contagious" disease. In other words, all contagious diseases are infectious, but all infectious diseases are not necessarily contagious.

In the present article, we shall discuss some of the diseases which are highly contagious, spreading rapidly and causing death of the infected animal, or lowered production, or both.

FOOT-AND-MOUTH

We cannot do better than begin with the foot-and-mouth disease, a name which is familiar the world over. The cause is a small particle of living matter called a virus which, in susceptible animals, is responsible for, among other things, the obvious changes in the mouth and feet from which the disease is recognized. Other results of the infection, which are not so obvious, are found in the stomach (rumen) and the heart, those in the heart being sometimes responsible for the sudden death of the infected animal, maybe some considerable time after apparent recovery has taken place.

All cloven-footed animals are susceptible to the infection. In some parts of the world, foot-and-mouth is considered as probably the most important disease of livestock; in other countries, its occurrence is not generally regarded as a serious problem. There are reasons for these different views. In countries in which there is a relatively high concentration of livestock and where intensive production is the objective, the chances of spread of the infection are very great and there may be a heavy loss in production, reflected not only in the finances of the individual farmer but in the economy of the country. It is estimated, for example, that the losses which arose from the 1951-52 epizootic in Europe amounted to at least $ 400,000,000. This loss represented mainly reduction in production during or subsequent to individual outbreaks or groups of outbreaks and the disruption of national and international trade in livestock and livestock products.

In the less developed countries, very often the disease is milder in character and the results are not so disastrous: in many of those countries, the disease is always present and is generally looked upon more as a nuisance, causing only some temporary inconveniences. This outlook, however, is not to be encouraged, for, periodically, the mild disease gives place to an acute phase with heavier losses, especially from deaths of infected young stock; the development of an expert trade in livestock and livestock products in such infected regions will continue to be much handicapped so long as foot and mouth is present.

ROLE OF VACCINATION

Much progress is being made in controlling foot-and-mouth in some individual countries, and the measure adopted by veterinary authorities, often as a result of assistance given by international organizations, is preventing the entrance of the infection into countries or groups of countries. While it is possible to apply a total out-and-out slaughter policy in some countries whereby any introduced infection is usually eradicated and the country is again free of the disease until a further introduction takes place, it is necessary in some countries, especially where the disease is endemic or where there is considerable exposure to the introduction of the infection, to carry out a vaccination campaign. The extent to which this is practised depends largely on circumstances, and varies from annual vaccination of all or practically all the cattle population to vaccination of cattle in frontier areas and in prescribed districts following an outbreak.

Vaccination is certainly playing an important part in controlling the disease in many countries. It is realized, however, that the objective behind vaccination is to reduce the incidence of the disease to such a low figure that a slaughter policy becomes economically possible. That stage is in sight in some countries and slaughter is being coupled with vaccination in others. Foot-and-mouth control by vaccination is made somewhat difficult because of the existence of different types of the causal virus, against each of which it is necessary to give protection by vaccination.

NEWER TYPES

For a long time, three distinctly different types of the virus were recognized in most infected countries throughout the world: four further types have now been shown to exist, three of which are at present confined to Africa and one to Asia. Again, some variations have been shown to exist in each of the originally known three types, necessitating the development of vaccines for use against them. Many of the difficulties in the preparation and production of foot-and-mouth vaccines are being overcome. New techniques are being used and it is probably only a matter of time until the old methods of preparation are replaced. Vaccines, as presently used, give good results and the disease can be rapidly controlled and spread prevented by vaccination.

In countries in which regular vaccination is carried out, suitable vaccines for protection against the types of virus most likely to be present in or to be introduced into the country, are used. It is always necessary to ascertain the type of the virus in any new outbreak whether or not a vaccination policy is being practised: this is done in laboratories which are equipped for this work. Such laboratories exist in several countries in different parts of the world: for special work on typing of the virus and for assisting countries, especially in Africa and Asia, in determining the types causing outbreaks, the Research Institute (Animal Viruses), Pirbright, England, is now recognized as the World Foot-and-Mouth Disease Reference Laboratory.

Vaccination is carried out almost entirely in cattle: there has still to be elaborated a more efficient product for the protection of pigs, in which foot-and-mouth may cause much damage and from which the disease often spreads to cattle.

In addition to a slaughter policy or vaccination, it is highly important in preventing the spread of the infection that early reporting of outbreaks takes place, that severe restrictions on the movements of animals in an infected area are imposed and that careful and thorough disinfection of infected premises is carried out before susceptible animals are again introduced.

While the distribution of the seven different types of the virus is fairly well known today, their appearance in new areas is being carefully watched so that measures for the prevention of their spread can receive attention. It is generally agreed that the eradication of foot-and-mouth demands both national and international action. A beginning has been made to eradicate the disease from the whole of Europe through the establishment of the European Commission for the Control of Foot-and-Mouth Disease. The intention is eventually to extend international control and eradication plans to other regions and, finally, at some stage to link up their activities and so cover as much of the world as possible.

RINDERPEST

At one time, it was considered that rinderpest (cattle plague) was probably the most important contagious disease of livestock, mainly because of the high mortality among infected animals. Although the disease has been widespread in different parts of the world, it is now confined to certain regions of Africa and Asia and, even there, it is gradually being brought under control although severe outbreaks periodically occur. The high mortality makes rinderpest a more spectacular disease than some others in which the losses, apart from actual deaths, may be very high. Strict measures against its introduction are taken by the veterinary authorities in countries which have always been free of it or from which the disease has been eradicated.

Immunizing of susceptible animals against the infection is now practised on an extensive scale in infected countries by the use of suitable vaccines. Fortunately, as opposed to foot-and-mouth, there is no evidence that more than one type of the causal virus

exists: this means that the production of satisfactory vaccines is simpler. The actual vaccines now in use differ markedly from those available in the earlier days of rinderpest control. The introduction of new methods of virus-vaccine preparation has resulted in the production of products which can be stored under suitable conditions for long periods, ready to be used when required. This stage has not yet been reached in foot-and-mouth vaccine production.

Vaccines now in use in the control of rinderpest consist mostly of the living virus in an attenuated or feebly virulent form, attained by passing the virulent virus through a species of animal of low susceptibility, e.g., goats or rabbits, or through the developing chick in fertile eggs. Susceptible animals, e.g., cattle and buffaloes, receiving a single dose of such a vaccine are rendered immune to natural infection for long periods, probably for several years or even for life. This finding simplifies the work in operating vaccination campaigns for the control of the disease. At the beginning of a campaign, all adult susceptible cattle and buffaloes in a satisfactory state of health receive a dose of the vaccine: these animals should not require any further vaccination. Periodically, vaccination is again carried out in the area when any animal not already vaccinated is dealt with. This includes animals which were considered too young to be treated on a former occasion or have been born since the others were vaccinated.

ALL-INDIA CAMPAIGN

Campaigns for the control of rinderpest differ from those against foot-and-mouth, for a serviceable immunity induced by the vaccines at present in use for the latter disease is of relatively short duration and injections have to be repeated at intervals of a few months and certainly once a year. In India, today,

An FAO specialist teaches Burmese technicians how to inoculate a bird against Newcastle

a carefully planned vaccination campaign for the control of rinderpest is being successfully operated throughout the subcontinent. A few years ago, a concentrated effort by the veterinary authorities in Thailand eradicated rinderpest from the whole of the country. Except for some occasional introductions, which have been dealt with successfully, the country has remained free of the disease. These examples illustrate the adoption of measures by individual countries: while they prove successful in controlling and even eradicating the disease in a specified area, there is need for international collaborative effort finally to clear rinderpest from all parts of the world.

It has been found that the degree of attenuation, i.e., reduced virulence of the virus in a vaccine, must vary according to the susceptibility of the animals to be treated. This has been provided for and vaccines are now available for use in countries and regions where even the most highly susceptible cattle and buffaloes are present.

The occurrence of rinderpest in wild ruminants will probably remain as a source of infection in some parts of the world, so that vaccination campaigns will still be needed.

The presence of rinderpest is preventing, to a considerable extent, the development of an export trade in livestock and products of animal origin in some parts of the world. It must be expected that countries free of the disease will continue to refuse such imports, so long as rinderpest is present in the exporting country or until scientific evidence shows the conditions under which there would be no risk of introducing the causal virus from such infected countries.

BOVINE PLEURO-PNEUMONIA

Another example of a contagious disease, at one time prevalent in many parts of the world and now confined to some specified areas, is contagious bovine pleuro-pneumonia. Even before modern methods of control became available, the disease was eradicated from several regions by veterinary activities and precautions taken to prevent its reintroduction have proved entirely successful. Today, contagious bovine pleuro-pneumonia occurs in some of the northern, eastern, western and central parts of Africa, in Australia where it is endemic in the northern area with sporadic outbreaks in southern districts associated with the movement of infected cattle, in Assam (India) and in a few European countries in which it is being satisfactorily controlled and eradication is in sight.

While the presence of the infection in an acute form in a group of cattle may cause high mortality, the most dangerous animals causing spread are those which have recovered and become "carriers" of the disease. In such animals, the affected portions of the lungs become sealed off and may remain in this condition for long periods: these lung areas, however, still contain the virulent causal micro-organism and, following a lowering of the vitality of the animal due to any form of stress such as long journeys and periods of drought, a "breakdown" occurs and the infection spreads to susceptible animals.

A clinical examination of acutely infected animals usually detects the disease; the post-mortem appearance of affected lungs is very typical of the infection. In examining a group of animals among which the infection is present, all of which may not show the typical clinical picture, it is necessary to make use of laboratory tests in which the serum of the blood is used.

MUCH WORK DONE

Contagious bovine pleuro-pneumonia can be prevented to a great extent in infected areas by vaccination of susceptible animals. A considerable amount of research work on the production of vaccines has been carried out and is still in progress in the different infected countries. For many years, a living culture of the causal organism inoculated into the tail has been used in Australia with good results: many vaccinated animals are capable of resisting infection within a few days, and remain in a protected state for at least three years. A very small number of excessive tail reactions are reported, and their occurrence in vaccinated calves may be followed by heart and joint complications.

Other types of vaccines being studied in different countries include those containing the causal agent in different stages of attenuation, cultivated in the developing chick embryo and the causal agent treated by chemical agents to which an adjuvant is added. In controlling the disease, it must be recognized that the spread takes place from already infected animals and that their movement into non-infected areas is an important source of new infections.

Pleuro-pneumonia in goats and sometimes in sheep causes much loss in some parts of the world: the cause, however, is probably quite different from that of the disease in cattle.

HAEMORRHAGIC SEPTICAEMIA

Members of the pasteurella group of micro-organisms are the causal agents of, or are associated with, some diseases of animals and birds. The group contains several types of pasteurellae and some may cause specific diseases. Such a disease is Haemorrhagic Septicaemia (barbone) of bovines which occurs especially during and after the rainy season in some tropical and

semi-tropical parts of Asia and Africa. The name Haemorrhagic Septicaemia is sometimes loosely used with reference to other diseases, the causal agents of which may yet have to be defined: with some of them, pasteurellae may be associated, probably in the role of secondary infectors. It has now been shown that Haemorrhagic Septicaemia or barbone is, almost certainly, caused by one type, and one type only, of a pasteurella (*Pasteurella multocida*-Roberts type I).

Unless immunization of susceptible cattle and buffaloes is carried out in infected areas, there may be high mortality from the disease: the occurrence of the disease often coincides with the time when the animals are much required for land cultivation purposes. The type of vaccine mostly used has been a chemically-treated liquid culture of pasteurella isolated from infected animals. While such a vaccine gives some beneficial results, the degree of immunity induced is relatively low and of such short duration that, in some districts, it has been necessary to repeat vaccination during the season of the infection.

BETTER VACCINES

Recent research work has resulted in the production of vaccines which give better immunity for a longer period. It has been shown that the immunizing substance is contained in the capsule which surrounds the causal pasteurella. This capsule is largely destroyed during artificial cultivation of the micro-organism: it is necessary, therefore, that very young cultures are used for the production of vaccine. Again, the pasteurella loses its immunizing value if it is subjected to a series of subcultivations; hence, strains of the micro-organisms very recently isolated from infected animals are necessary. The mixture of these cultures with an adjuvant has been shown to be of much importance in the preparation of an efficient vaccine and good results are reported following the injection of vaccines prepared by methods which make use of such discoveries.

Modern vaccines for use in the control of Haemorrhagic Septicaemia meet the necessary requirements, viz., they can be produced in bulk, they are easy to administer, they do not produce undesirable reactions, and they produce immunity of a sufficiently high order and duration to protect susceptible animals for the required period. Vaccination campaigns should not be difficult to arrange because the time of the annual occurrence of the disease is usually known within limits.

NEWCASTLE DISEASE

While there are many diseases of poultry of considerable economic importance in most countries, that which has caused the greatest loss to the industry is probably the Newcastle disease (Ranikhet). There are few parts of the world, where poultry are kept on an extensive scale, free of this virus infection. At one time, it was thought that the disease existed only in an acute form from which practically all infected birds died. We know now that there is a much milder type in some areas, causing losses through lowered egg production and interference with the general health of poultry. Although this latter type of the disease may not be accompanied by many deaths in a flock, periodically the acute form appears in infected flocks with disastrous results. The modern methods of intensive poultry husbandry favour rapid spread of the infection. Reliable laboratory tests for which samples of blood are used are now available for the detection of the disease, including the milder forms.

Much study has been made of the control of the Newcastle disease. In some countries, a slaughter policy is practised: all the fowls in an infected flock are destroyed and burned or buried, and the premises are thoroughly disinfected before restocking is permitted. For economic reasons, this method cannot be carried out today in many parts of the world. There are, however, vaccines which give satisfactory immunity against the infection. Although different vaccines are in use in different countries and the methods of their application vary, the best results appear to be obtained from vaccines composed of the living causal virus, the virulence of which is such that it does not cause infection in susceptible fowls.

The causal virus used as a vaccine is now usually cultivated in developing chick embryos. Very young chicks may become infected and high mortality among them may occur. They may be protected to a considerable extent by the satisfactory immunization of the breeding fowls the fertile eggs from which contain protective antibodies which are passed on to the chick in the egg. Such immunity, however, is of comparatively short duration, continuing at an adequate level for only a relatively short time; further immunization of such chicks at a few weeks of age becomes necessary.

Some recent work has shown that very young susceptible chicks may also be protected by the use of a vaccine prepared from a strain of the virus found in England in a naturally-attenuated condition. Here again, the immunity is of short duration and further immunization is required at a later date. The virus-vaccine may be applied, especially in young chicks, by inhalation, through depositing it on nasal openings: it may also be dropped into the conjuctival sac of the eye. In

CONTD. ON PAGE 29

Getting the Best Out of Fertilizers

TO get the best results with fertilizers you must know: what fertilizers to use; how much of the fertilizers to use; and when and how to apply fertilizers.

Ammonium sulphate is the most common nitrogenous fertilizer farmers use. It contains 20.6 per cent nitrogen. Ammonium sulphate nitrate is another. It contains 26 per cent nitrogen. Urea is the third one. It contains 45 per cent nitrogen.

Bonemeal is the common phosphatic fertilizer used by farmers. It contains 19 to 20 per cent phosphoric acid. "Single" superphosphate, also commonly used, contains 19 to 20 per cent phosphoric acid.

Potassium sulphate contains 48 per cent potash. Muriate of potash, another potassic fertilizer, contains 60 per cent of it.

Different field crops require plant foods in different proportions. Hence, you have to apply the fertilizers in the required quantities. Fertilizer mixtures, containing two or more plant foods in the required proportion, are available in the market. These can also be conveniently used.

HOW MUCH OF IT

The quantity of fertilizers you should apply depends upon the crop you are growing and the plant foods the soil lacks in.

Soil tests will help you find out what plant foods are wanting in your soil. Your Agricultural Officer or Village Level Worker will be able to tell you how to take soil samples from your fields and where to send them for testing.

Some crops need more of fertilizers than others. Normally, the more the vegetative growth in a crop the more the fertilizer it needs. Crops like sugarcane, potato, tobacco and summer vegetables, which have good vegetative growth, need more fertilizers than other crops Your Agricultural Officer will tell you about the fertilizers and the quantity of each you have to use.

AND WHEN

To get the best results from fertilizers, you have to apply them at the proper time.

Where double-cropping is practised, it is better you apply the full dose of the fertilizer right at the start.

Generally, the winter season crops need fertilizers in two doses. To such crops, you can apply the first dose before sowing or planting, and the second a month or a month and a half later, just before irrigation.

Kharif crops, which are usually raised without any irrigation or with only one irrigation or two, should receive fertilizers in the earlier stages. So, to get good results, apply the fertilizers at sowing, planting or at the time of transplanting the seedlings.

For paddy of a short duration, apply the fertilizers in one dose at the time of transplanting. For a long-duration variety, apply fertilizers twice—half the quantity at transplanting and the rest after one or 1½ months.

Apply nitrogen to sugarcane in two doses—half at planting and the other half at the time of earthing; but apply phosphate and potash in one dose when you plant the cane.

For irrigated cotton, it is best that you apply nitrogen in two doses—half the quantity at sowing and the rest when the bolls are just forming.

For summer and winter vegetables, which require heavy doses of nitrogenous, phosphatic and potassic fertilizers, apply phosphatic and potassic fertilizers at the time of sowing or transplanting. Nitrogen may be applied in two doses—half at planting and the other half at earthing or 1½ months after planting.

HOW TO APPLY

Generally speaking, fertilizers supplying nitrogen should be applied broadcast or by topdressing the crop, and fertilizers supplying phosphate and potash should be placed near the plant roots.

In any case, apply fertilizers in such a way that crops can make the best use of them. Do not feed the weeds.

Farmers commonly broadcast fertilizers. This method is suitable when you grow cereals and millets which are planted in narrow rows, and also when you sow your crop broadcast.

If you want to broadcast the fertilizer, do it before you plough the land. When you plough the land with a soil-turning (mould-board) plough, the fertilizer will remain in the moist layer of the soil.

If you want to mix the fertilizer well with the soil, then broadcast the fertilizer on a ploughed field and mix it by working a *desi* plough.

When you are using a small quantity of a fertilizer, better mix it with twice or thrice the quantity of soil to distribute it uniformly.

"PLACING" IT

Instead of spreading the fertilizer all over the field by broadcasting, you can "place" it at particular places where the plant roots can easily reach it.

Placing the fertilizer has many advantages. The fertilizer being near the seeds, the roots of seedlings can easily feed on it. Secondly, the fertilizer is placed in the moist layer of the soil, which is ideal for plants to feed on it. Thirdly, weeds, which grow in the surface layer, cannot reach it.

When you drill the fertilizer in the soil in rows along with the seed or near the seed, it is called drill placement. You can follow this method for applying phosphate and potash. The method is useful for small grains which are not harmed even if a small quantity of the fertilizer comes in contact with them. For drill placement of the fertilizer, you can use a bamboo or a metallic tube, about an inch in diameter and fitted with a funnel. This unit is known as *pora* and *sarta* in northern and central India, respectively. Attach the *pora* to a *desi* plough. Drill the fertilizer four inches below the soil surface, and sow the seed only about two inches deep.

In plough-sole placement, you place the fertilizer in a continuous band behind the plough at the bottom of the furrow. As the next furrow is turned, the fertilizer gets covered. You can follow this method in areas where the surface soil gets dry when the crop is growing. Because the fertilizer is placed deep, it will lie in the moist soil layer where the plants usually send out the roots. This method is good for applying phosphatic fertilizers.

Seeds of cotton, tubers of potatoes and seedlings of tomatoes are sensitive to contact with fertilizers. For such crops, apply the fertilizer an inch deeper than the seed in bands on one side or both the sides of the seed row, about 1½ to two inches away. You can follow this method both for applying the fertilizers at the time of sowing and for topdressing a standing crop. It is very useful for fertilizing a crop growing in lines.

For crops which are dibbled or transplanted and those which are sown with a broad spacing, apply the fertilizer at a place where the seed is to be dibbled. Place the fertilizer an inch or two deeper than the seed. In heavy rainfall areas, fertilizers can be dibbled in a standing crop of sugarcane. For paddy, also, you can press down fertilizer pellets in the puddled soil at specific places.

For crops which are sown with a very broad spacing, you can apply the fertilizer in a ring a few inches deep round the plant.

In addition to the above methods, you can also apply fertilizers in irrigation water, especially when you are applying the second dose of the fertilizer to a crop which has covered the ground.

The quantity and the kind of fertilizers to be applied to a crop vary from place to place in each state. Hence, consult your local Agricultural Officer or Gram Sevak for information on what type of fertilizer, and how much, has to be applied to your crop, when, and also how.

CONTD. FROM PAGE 27

Contagious Animal Diseases

older fowls, a more potent type of vaccine is often given into the wing web. Experience has shown that using vaccine prepared from the above-mentioned naturally-attenuated strain of virus simultaneously with a vaccine prepared from a mild strain of the virus which causes fowl pox, young chicks may be protected at the same time temporarily against both the Newcastle disease and fowl pox.

I Grew Paddy The Chinese Way

by
S. Manzar Hussain Shah Alam
Itahri, Purnea, Bihar

My "Chinese" crop after the leaves were cut

IT is quite encouraging that our Government has decided to try out the Chinese method of paddy cultivation at 30 different places in the country to see whether it can be successfully adopted in India. I say this because my own experience with this method has been quite happy. On my farm, I have compared this method with the Japanese method and have found it to give a yield of 1,020 maunds per acre, as against 112 maunds by the latter.

To my mind, the basic differences between the two methods are: the ploughing in the Japanese method is nine inches deep, whereas in the Chinese method it is up to 39 inches; the fertilizer in the Japanese method is applied on the surface of the soil, in the Chinese method the maximum dose is given in the lower layers; in the Japanese method transplantation is done once only, in the Chinese method it is done twice; the spacing given in the Japanese method is one foot × one foot, in the Chinese method it is less than that.

Such deep ploughing as in the Chinese method, however, is very difficult with an ordinary country plough, especially in large-scale farming. And ploughs which can go to such a depth are beyond the means of an average Indian cultivator. Digging an acre of land to a depth of three feet would mean an expenditure of Rs. 1,959 (taking labour expenses as Rs. 1.50 per hundred square feet). The cost of mixing the fertilizer and the replacing of the dug-up soil would be extra. Yes, if easy and inexpensive methods of deep ploughing could be found out, there would be no difficulty.

I am also convinced that it is better to apply the fertilizer in the lower layers of the soil. On my farm, I have noticed that the portion of the crop growing on the site of an old compost pit yields more than that growing on the neighbouring land, though it does take a little longer to mature. Similarly, the bed of a 30-year old nullah which I have put under cultivation gives a better-yielding crop.

Almost every farmer knows that re-transplanting cauliflower gives larger flower-heads. The same principle perhaps is applied in the Chinese method in which, unlike the Japanese method, a second transplantation is done. In my village, farmers use early transplanted paddy as seedlings when there is shortage of seedlings for late planting; they thus recover the seed along with the crop. I am told that the farmers of Raj Mahals in the Santhal Parganas district of Bihar adopt re-transplantation for their summer paddy, and that the Bihar Agricultural Department has acquired 12 acres for work on re-transplantation in *kharif* paddy also.

As regards narrow spacing, I have found it harmful in early varieties, as it helps in the spread of disease and thus reduces the yield. The minimum distance, in my opinion, should be 12 inches × 6 inches for early varieties and 12 inches × 4 inches for late ones.

Cutting of the leaves is an important part of the Chinese method of paddy cultivation. The leaves should be cut with a sharp knife when weeding is taken up after the final planting and before applying the final dose of ammonium sulphate. This prevents lodging and promotes tillering. Even in a field cultivated by the Japanese method, I obtained an average of 85 tillers in one hole by adopting this practice. Each earhead contained nearly 250 grains, or 21,250 grains per hole. This works out to 40 *tolas* (8 *chhataks*) of grains from each hole, assuming that 525 healthy grains go to make a *tola*.

The net profit per acre under the Chinese and the Japanese methods works out to Rs. 7,435 and 842, respectively. The price of paddy has been taken as Rs. 10 per maund.

WHAT'S NEW IN FARMING

Raising Tobacco Seedlings

AN easy method of reducing the loss of tobacco seedlings in the nursery has been found out at the Hookah and Chewing Tobacco Research Station, Pusa, Bihar.

The method involves using a lower seed-rate and providing shade to the seedlings.

In Bihar, farmers experience a considerable loss of seedlings in the nursery because of the "damping off" disease. A large number of seedlings are also damaged because of beating rains. It is seen that "damping off" often occurs if there is a shower of rain immediately after sunshine and, more so, if seedlings are overcrowded. The overcrowding occurs because the farmers use as high a seed-rate as one to two ounces per 200 square feet of nursery.

It has been found at the Station that the loss of seedlings can be reduced considerably if the seed-rate is brought down to one-third ounce per 200 square feet of nursery, and the beds are shaded with *tatties* or thatching made from grass and split bamboos.

The thatching should be removed every morning for two or three hours, if there is no rain, so that the seedlings may get exposed to the sun. Shading is discontinued after the seedlings are about two weeks old.

"Sea Island" Cotton

SEA ISLAND cotton growers on the West Coast need not be satisfied with the low *kapas* yields they have been getting from the crop so far. With proper manuring, they can get higher yields.

Experiments show that application of three tons of farmyard manure, 500 pounds of lime, 50 pounds of potash and 30 pounds of phosphoric acid per acre as basal dressing, and 60 pounds of nitrogen as topdressing leads to a very good yield. The nitrogen for topdressing is to be supplied in two equal doses, in the fourth and eighth weeks after sowing.

The yields obtained in the experiments with this manurial schedule amounted to 645 pounds of *kapas* per acre, bringing in a net profit of Rs. 183 per acre. A significant improvement in fibre length and fibre maturity was also seen.

"Panjore Common" Litchi

STUDIES carried out in the Punjab on seven varieties of litchi show that *Panjore Common* is the best for growing on a commercial scale.

Panjore Common bears large-sized, heart-shaped fruits with an attractive deep orange to pink colour when fully ripe. The peel is paper-thin. The fruit ripens towards the end of May, and has the longest harvesting season among all the varieties, extending as it does over a month.

The variety has a good fruit-size and small peel percentage, and plenty of pulp.

Cotton Needs Manuring

To get a good yield from cotton in Uttar Pradesh, farmers are advised to manure the crop partly with cattle manure and partly with ammonium sulphate.

Normally, farmers manure wheat and sugarcane, considering that the residual effect of the manures applied to be sufficient for the following cotton crop.

But experiments show that to yield well, the cotton crop needs to be given 45 pounds of nitrogen per acre. This can be done by applying five maunds of castor cake or 60 maunds of cattle manure, and 1¾ maunds of ammonium sulphate.

The cattle manure or cake should be applied before sowing, and the ammonium sulphate at the early flowering stage.

Wart Disease Of Potato

POTATO growers, especially in West Bengal, Bihar, Orissa, Uttar Pradesh, and the Punjab, are warned not to use seed potato imported from Darjeeling, as it has been found to carry the dangerous "wart" disease of potato.

The disease has recently been found to be widespread in the hill regions of Darjeeling district in West Bengal, and in Sikkim and Nepal. The seed potato marketed as "Darjeeling Potato" may come from any of these places.

The varieties *Red Round*, *White Long*, *White Round* and *Kala Alu* get the disease easily and, as a result, farmers lose heavily on their crop.

Areas importing the Darjeeling potato for seed purposes will be importing the disease along with it. Once the disease gets established, it will be very difficult to get rid of it.

CHINHAT'S PROJECT "NEW MAN"

by
Rama Das
Director
Planning, Research and Action Institute
Lucknow

LAST year, the Planning, Research and Action Institute of Lucknow launched a pilot project called " Evolution of the New Man" at Chinhat, a village about six miles from Lucknow, with a view to training the local youths in various crafts to bring about a change in their social outlook and to provide employment to them and the surplus labour in the locality.

The scheme was so successful that it was later extended to another four districts in the State. They now have about 5,000 youth clubs with about 90,000 members in the age group 12 to 20, who are engaged in crafts like carpet and *newar*-making, *durrie*-weaving, sericulture, etc.

The Government of India has also taken the cue and has recently recommended a scheme for organizing such rural industrial estates in the country.

Studies by the Institute have revealed that no industrial unit can run economically in all years, particularly when there are wide fluctuations in market prices. In composite units, however, losses in one section can be made up by others ; the overhead expenses can also be spread over a number of industries, thus making full use of the managerial skill, labour and power.

Chinhat was selected because it has both road and rail facilities. It has a population of 2,500. Once an important centre of trade, it has been gradually decaying. The families of many craftsmen are passing through hard times, for the goods they produce are not selling in the competitive market. Agricultural practices are of a low standard and irrigation facilities poor. The incidence of crime was quite high.

WORK BEGINS

The State Government, in the first instance, sanctioned a Pilot Project on Pottery for Chinhat. In December, some team members visited the village and held consultations with the *pradhan* and *panches* of the village. The *panchayat* agreed to donate a site covering about 2.5 acres within the village *abadi* for the new project. Work on this pottery unit began in the latter half of December, 1957.

The construction of sheds and other buildings was taken up after preparing the necessary site-plans. Arrangements were made to purchase bricks from the local kilns and utilize the local labour for the construction. Skilled labour which was not locally available had to be provided from other areas ; the unskilled labour was mostly provided by the local people. The wages varied from Re. one to Rs. 1.50 per day.

Within a record time of about four months, six sheds—office building, furnace, chimney and other sheds, were constructed. Though the whole unit was

A trainee learning pottery

set up by the end of April, it could not go into production due to lack of electricity. Under these circumstances, production of green stoneware with potters' wheels was started. Later, a small engine was purchased to run a small ball mill and two jiggers and jolleys. Production is thus being continued though not in full swing, as electricity is still a problem.

Rope-making machine. The Industrial Adviser to the State Government and some team members who visited East Punjab found the rope-making machine a useful and inexpensive means of giving employment to the local people. With this machine, a man can earn Rs. two to 2.50 per day. Two machines were initially ordered for ; later, 12 more were obtained. As soon as local raw material is available, a few more machines will be added.

Cow-dung gas plant. A small-scale trial with cow-dung gas in this State has shown that the BTU (British Thermal Unit) value of this gas is about 1½ times that of coal gas, and that it should be possible to use it for a number of purposes. A big plant has, therefore, been set up at Chinhat for providing gas for cooking, for illumination (subsequently, experiments were made with a fan, heater, etc.) and for heating the chambers constructed for drying the green stoneware, etc.

With a view to utilizing the gas for running internal combustion engines, chaffiing fodder and lifting water, experiments are now being conducted.

Chappal **making.** The Institute is successfully running a pilot tannery at Mohammadabad in district Farrukhabad, to give employment to the needy. Artisans are being trained in the trade.

Windmills. Some imported windmills were tried out in some parts of the State about five years back, but the results were very discouraging. The Institute shifted one of the windmills which had been installed at Aligarh to Chinhat where with some modifications and adjustments, it is now working. Such windmills can provide clean water for drinking and for irrigation, particularly during summer when the wind velocity is high. Efforts are being made to improve and develop new windmills for meeting the need.

A small workshop has been added to fabricate machine parts needed in this estate. A number of other small industries are proposed to be started as soon as power is available for the unit. The idea of having a number of centres under one management is that the overhead charges will be proportionately distributed to different units, power will be properly utilized and ample avenues of employment would be available.

Training programmes. After these units were set up, 60 youngmen with varying qualifications—from high school to primary school, and some illiterates too, were recruited for working on the estate. They were given a 15-day training which included various subjects like physical education, social education, etc. They were then switched on to job training, lasting two months, according to their preference—some preferred pottery, some rope-making and others leather work. During the job training, some weeding out was also done ; the men were given no stipend. About 50 men who have completed the training, will now be absorbed in the various units.

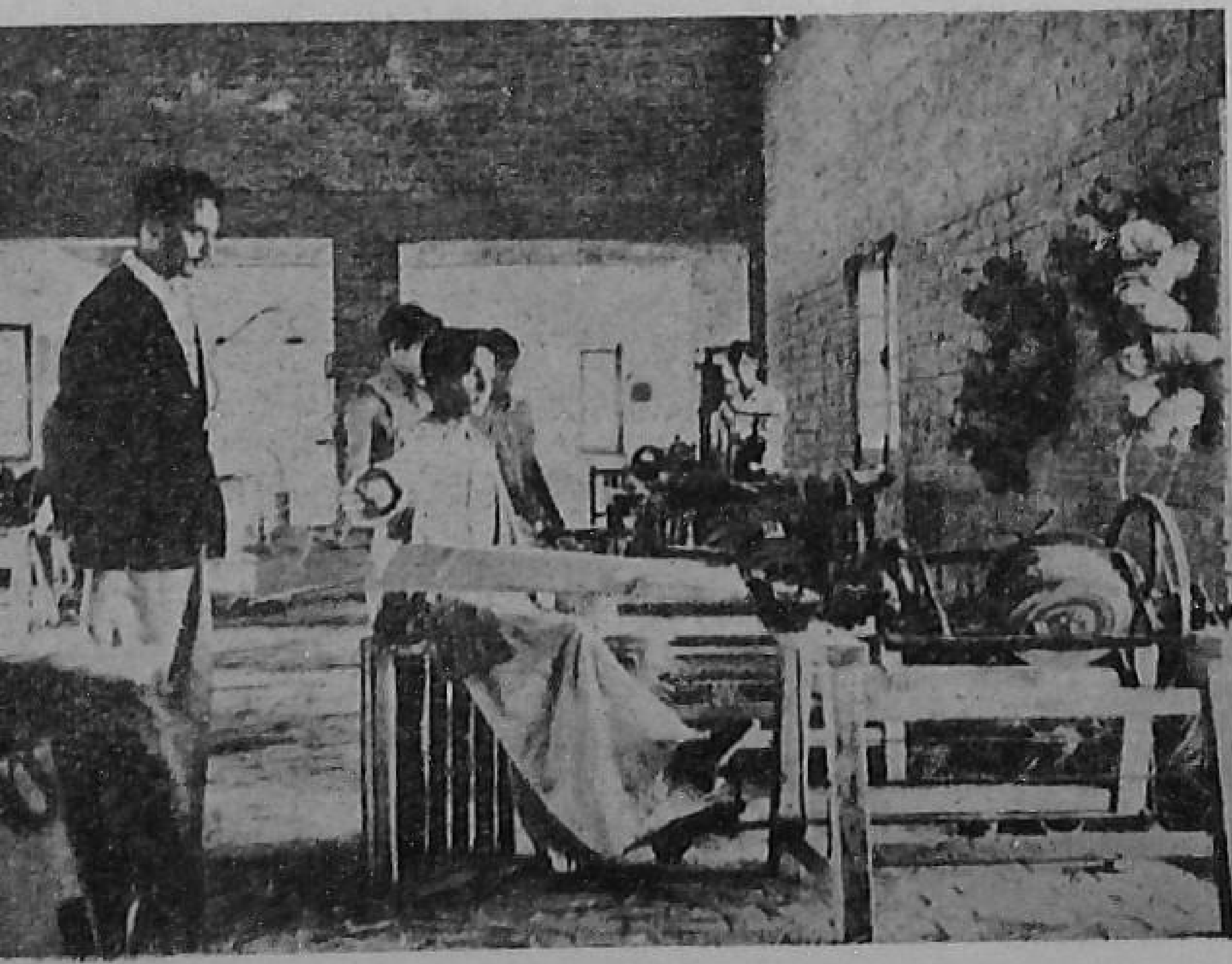
Youth programmes. To reduce social distance and to remove economic inequality, youth programmes have also been launched under the project. In a cluster of villages including Chinhat, Ismailganj, Uttar-dhauna, Matiyari and Malhaur, group meetings and social gathering were held, where people were encouraged to get together more and more.

Under the economic programme, 500 maunds of pure seed were supplied to the cultivators of Chinhat and Malhaur. Demonstrations in dibbling, line-sowing, mixed cropping and half-field demonstrations were conducted to educate the cultivators in better methods of farming. Thirteen Sahiwal heifers worth about Rs. 450 to 750 each were supplied at a nominal security deposit of Rs. 50.

A training camp in *charkha* spinning was started in February, 1959 ; 26 women of Chinhat are receiving training. and it is hoped they will soon start spinning independently, and earning also. The Women's Programme Section of the Institute will organize village women to make them more useful members of society.

Since the launching of the Project, there has been a visible change in the outlook of the villagers ; thefts, crop damage and litigation have declined markedly.

A rope-making machine in operation



MORE SCHEMES IN VIEW

It is now contemplated to organize co-operatives in rope-making, pottery, leather-work, etc., which will first be made commercially sound. The workers will be trained and will handle the raw materials, prepare the goods and market the products.

To foster a feeling of brotherhood among the youths, they will be required to reside in a common hostel. With their earnings from the Industrial Estate, they will be able to help their parents and bring up their children with a reasonably good standard of living. Occasionally, they will be sent to the nearby villages, where they will help other youths to organize youth clubs and to inculcate in them a spirit of self-reliance. For the all-round development of the nearby villages, various schemes have been devised, like agricultural services, housing projects and health programmes (under the W.H.O.).

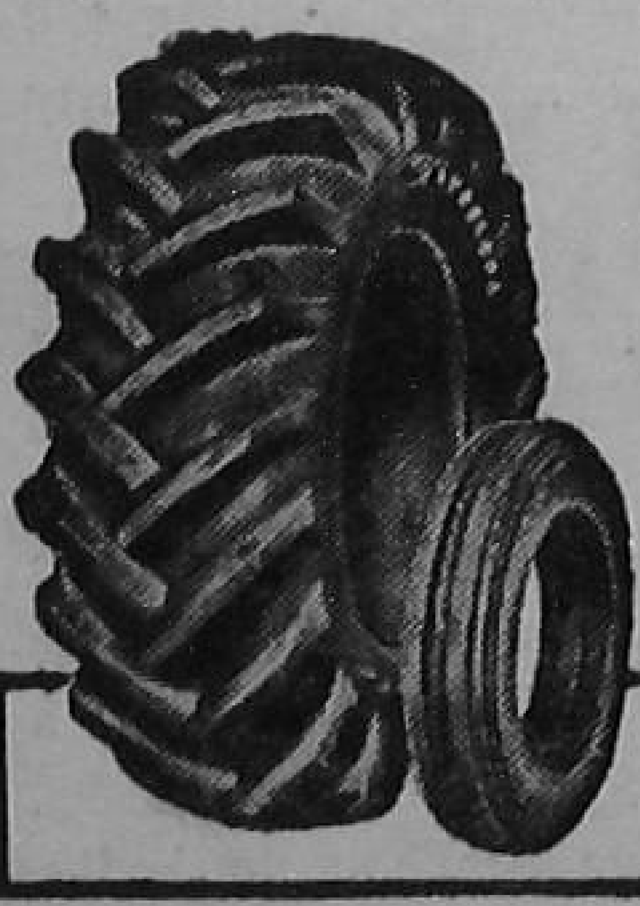
It is proposed to add a workshop and a work-shed to the existing unit to provide employment to school children on Saturdays and Sundays. The income from this work will meet their school fees and the cost of books.

It is proposed to set up, under the village *panchayats*, Action Subcommittees for various activities like agriculture, animal husbandry, public health, social education, etc. There will be Community Centres in the villages, where villagers will meet to discuss their common problems. Libraries will spring up. The adult literacy programme will be strengthened. The village school will be fully developed and health education will be introduced in collaboration with the Education Department, which will look after the health of school children.

Finally, some more units will be added to the Indnstrial Estate with a view to providing full-time employment to 300 to 400 persons of the nearby villages and part-time employment to village women and school children. A colony will be developed where youths will reside and develop their faculties further, so far as their behaviour and social cohesion are concerned. The Dayalbagh Colony at Agra which started with Rs. 5,000 and two acres of land, has now developed into a colony spread over an area of about two square miles.

The Earth is his Heritage — Today's child-Tomorrow's farmer

Basic education and modern technology will help the farmer use his land to the best possible advantage for the benefit of his country, his sons and his sons' sons. Each successive year will see more and more tractors and implements assisting him in his productive labours. And all those tractors need tyres— Firestone tyres—for it was Harvey Firestone himself who made the first pneumatic farm tyre thereby opening up a better future for farmers throughout the world.



Firestone

PUT THE FARM ON RUBBER

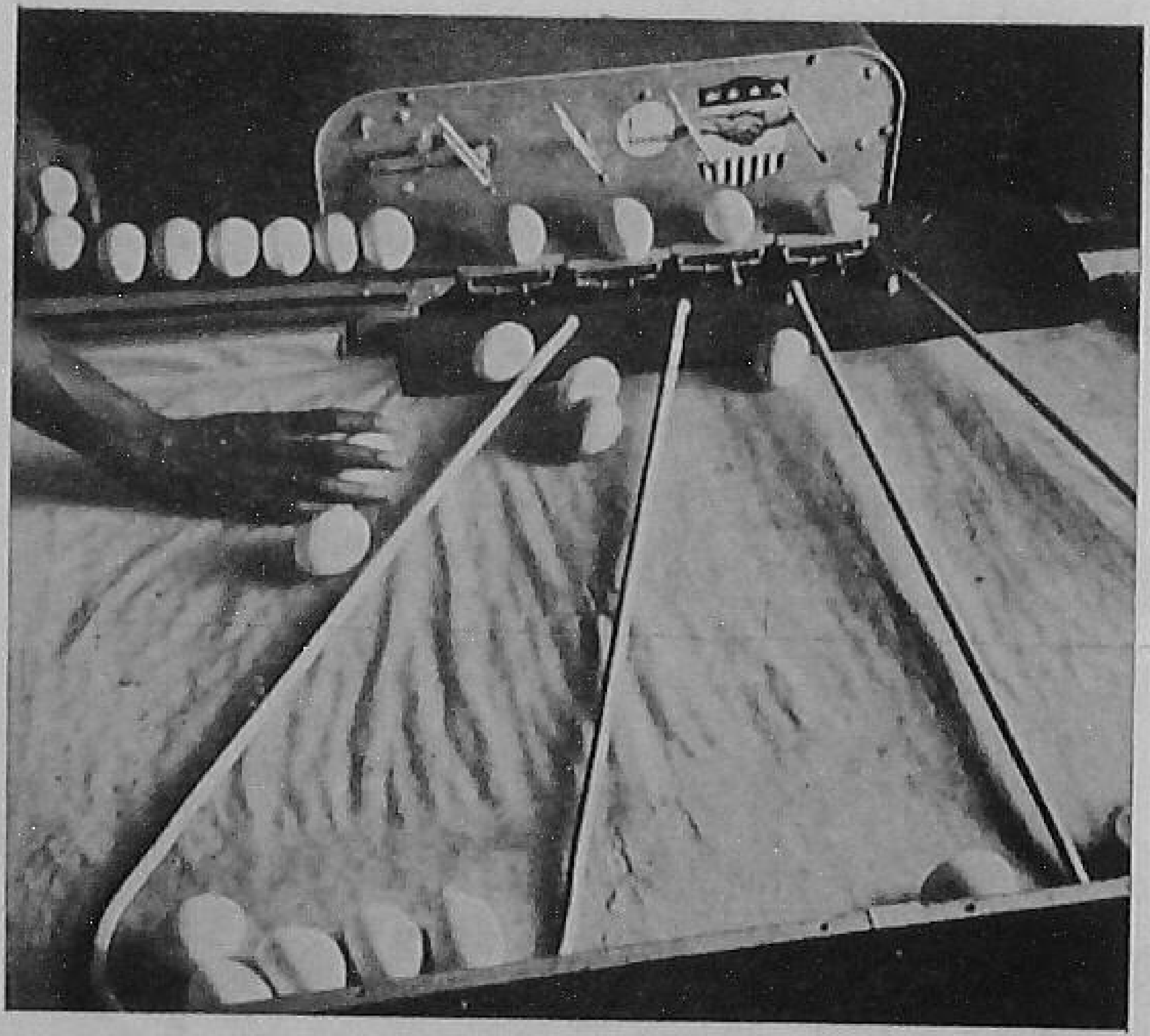
Support all activities of the Young Farmers Association, India, for a brighter future on the farm.

ABOUT three months back, the Rambler walked into what he later discovered was a well-equipped poultry farm with some entirely new features. It is the State Poultry Farm at Tollygunge in the heart of Calcutta. The farm, which was started in December, 1958, is part of a scheme to promote poultry farming among displaced persons from East Pakistan as a profitable avocation.

Also, it is one of the first in a chain of farms to be set up in the State to rear ducks to meet the demand for duck eggs and ducklings at present imported from East Pakistan.

Less room is required if birds are kept in cages like these. This also means less feeding time and more convenience.

The egg-grading machine



TOLLYGUNGE POULTRY FARM HAS SOME GOOD FEATURES

Training in trapnesting birds

The total number of birds at present on this farm is about 9,500, of which 1,500 are laying stock. Since the farm was established, about 20,000 chicks have been hatched out, and it is programmed to take this number up to 70,000 by January, 1960. An incubator of 15,000 egg-capacity is already functioning, and four more of 10,000 capacity each are to be installed shortly.

Layers, when ready, will be distributed to displaced persons. About 5,000 birds, mostly cockerels, have already been made available to the various rural development schemes for upgrading of *desi* birds. Each D.P. family is entitled to receive 100 birds with poultry cages as part of their resettlement benefit.

Under another scheme, displaced women are employed at the farm on jobs such as collection

of eggs, chick-rearing, egg-recording, egg-grading, rearing of birds in cages, feeding and watering of birds, etc. This work is expected to serve as a practical training for them. After three months of this employment-*cum*-practical training, they are provided with birds and cages and other necessary equipment to start their own private units. Rearing of chicks in cages is advocated because the system is economical as regards space and labour required in looking after the birds.

A special feature of the farm is that it aims at providing the poultry-keeper, in as final a form as possible and at one place, with all the accessories, feeds, etc., to run a poultry farm efficiently. A full-fledged workshop attached to the farm manufactures cages, brooders and trap-nests. All this equipment has been standardized here after trying out the various models, and an effort is made to keep down their cost to the minimum by using cheap materials. A separate section deals with the preparation of balanced feed-mixtures for sale.

Though the farm was established mainly to help in the resettlement of displaced persons, its popularity has given the authorities encouragement to enlarge its scope and extend its services to the general public also. Already, it is meeting a good part of the demand for table eggs, chicken meat, poultry equipment, feeds, etc.

—The Rambler

DITHANE

an organic fungicide, controls diseases of VEGETABLES, FRUITS, AGRICULTURAL CROPS and ORNAMENTALS. DITHANE means BETTER disease control. DITHANE permits NORMAL GROWTH and gives GREATER YIELD and BETTER QUALITY.

CUPROXOL

assures protection of edible plants, ornamental plants and fruits, against the different plant parasites, sensitive to Copper to which they are subject.

RHOTHANE

is very useful to farmers, planters, orchardists and vegetable growers because of its superiority in the control of pests. It is one of the safest insecticides.

KARATHANE WD

is an organic fungicide that controls powdery mildews without harming the crop, the blossom or the foliage of fruit trees, vegetables, field crops and ornamentals. It also controls certain mites.

★

For further particulars, please apply to

AMRITLAL & CO. Private LTD.

11, SPROTT ROAD, BALLARD ESTATE,
P.O. BOX 256, BOMBAY-1.

WORLD AGRICULTURE FAIR

Exhibition Grounds,
Mathura Road, New Delhi.

DECEMBER 11, 1959 to
FEBRUARY 14, 1960

Patron-in-Chief
Jawaharlal Nehru
Prime Minister of India

★ India's biggest exhibition ever . . . and first Agriculture Fair in the World.

★ Participants : Many foreign countries, including USA, USSR and China ... Ministries of Government of India... All State Governments . . . Rural Industries, and Handloom and Cottage Industries Organisations . . . Private Sector undertakings connected with Rural Economy.

Organized by
BHARAT KRISHAK SAMAJ
(National Organization of Indian Farmers)

WAF—1677

Does Paddy Really Want Standing Water?

by
B.N. Ghosh
Rice Research Station
Chinsurah, West Bengal

RICE can thrive under a variety of field conditions. Some varieties can grow in an unsaturated soil, and others in several feet of standing water ; many thrive under intermediate conditions. This characteristic adaptation of rice to different levels of water has prompted several investigators to study whether standing water is essential for proper growth and yield, or whether it is an unavoidable natural condition of the locality to which the variety has adapted itself.

According to Sen, flooding the field after transplanting for about three weeks in *aus* (summer) and somewhat longer in *aman* (winter)—because of the longer period of growth, followed by subsequent draining off, is beneficial to the growth of the plant ; it suppresses tiller production, the number decreasing with the increase in water level. The height of the plant increases with the water level. It has been suggested that water produces and maintains a certain soil texture and temperature suitable for young seedlings during their early stages of growth ; in the later stages of growth, draining is necessary for aeration.

Chakladar found that under 33 per cent saturation none of the plants formed seeds, though some of them flowered, while the plants under 75 and 50 per cent saturation formed seeds, showing that during the flowering stage water is essential for seed formation.

The effects of varying water levels on the growth, yield and nitrogen content of rice varieties in pot culture have been studied by Ghosh. He found that the number of tillers, total leaf area, total dry matter and grain yield increased with water treatment up to the soil level in pots, but decreased progressively with the rise in water level. Plant height and individual leaf area were found to increase with the rise of water level. The water content of stem and leaf was similarly affected, the increase being greater in the stem. Both nitrogen content and dry weight of root decreased with increasing water level. The nitrogen content of the stem and leaf, on the other hand, was high under water-logged conditions, owing to the accumulation of unutilized nitrogen. Under partial drought, plant growth suffered ; this was due to insufficient supply of water rather than of nitrogen, as evidenced by the fact that the nitrogen content of the stem and leaf was not much reduced. Where water was maintained up to soil level (puddling condition) stem and leaf nitrogen was low because of its better utilization under optimum condition.

DIFFERENT WATER LEVELS

Ghosh's experiments indicate the necessity for maintaining different water levels at different stages of growth and development, i.e., two to three inches in the field for two weeks after transplanting, followed by drainage and maintenance of the soil in the puddling condition for five to eight weeks, for optimum tillering. Standing water at the time of ear emergence and grain formation has some beneficial effect.

Ghosh has further recorded the time of day for the accumulation of the maximum dry matter in the leaves in different treatments. In soils saturated with water, the maximum dry weight was noticed between 2 and 5 p.m., while in standing water of levels two and 12 inches it was at 2 p.m. and 11 a.m., respectively.

SUGAR CONTENT

The principal sugar in the leaves is sucrose ; reducing sugar is present in very small quantity. In the leaves formed earlier, the sugar content is higher ; later, there is a gradual fall. The sugar content of the leaves increases with increasing water levels, partly due to the fact that sugar, not being utilized in the meristematic region for the production of tillers, accumulates.

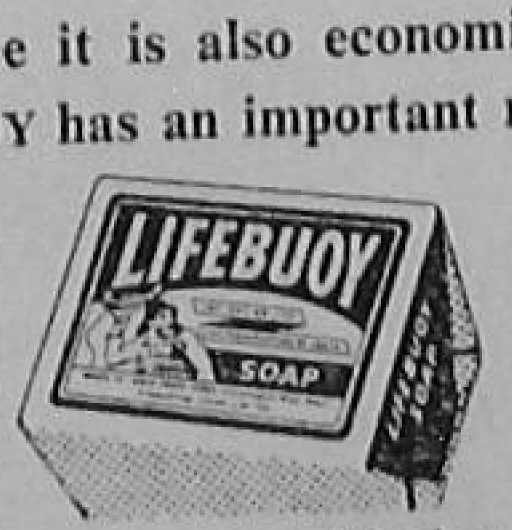
Ghosh and Bhattacherjee have observed in *boro* paddy that the number of tillers increases up to a

'WE NEVER KNOW THE WORTH OF WATER TILL THE WELL RUNS DRY'

It is no surprise that much development work in India has to do with water. But our gigantic irrigation and power projects are doing more than taking water to parched lands and creating fresh power for industry. They are increasing the supply of water for everyday human needs: for drinking, cooking, *and for keeping us clean.*

But water, of course, is not enough to keep us *really* clean. This is a fact of life that hits the villager hard because he cannot avoid picking up dirt, whatever his work. And since dirt contains germs and so the threat of disease, he daily runs the risk of sickness. To wash away the germs in dirt he needs more than water — he needs a good soap. A simple idea, but now the villager is learning ways of turning it into a good habit, which is just as well, for his prosperity depends on his good health.

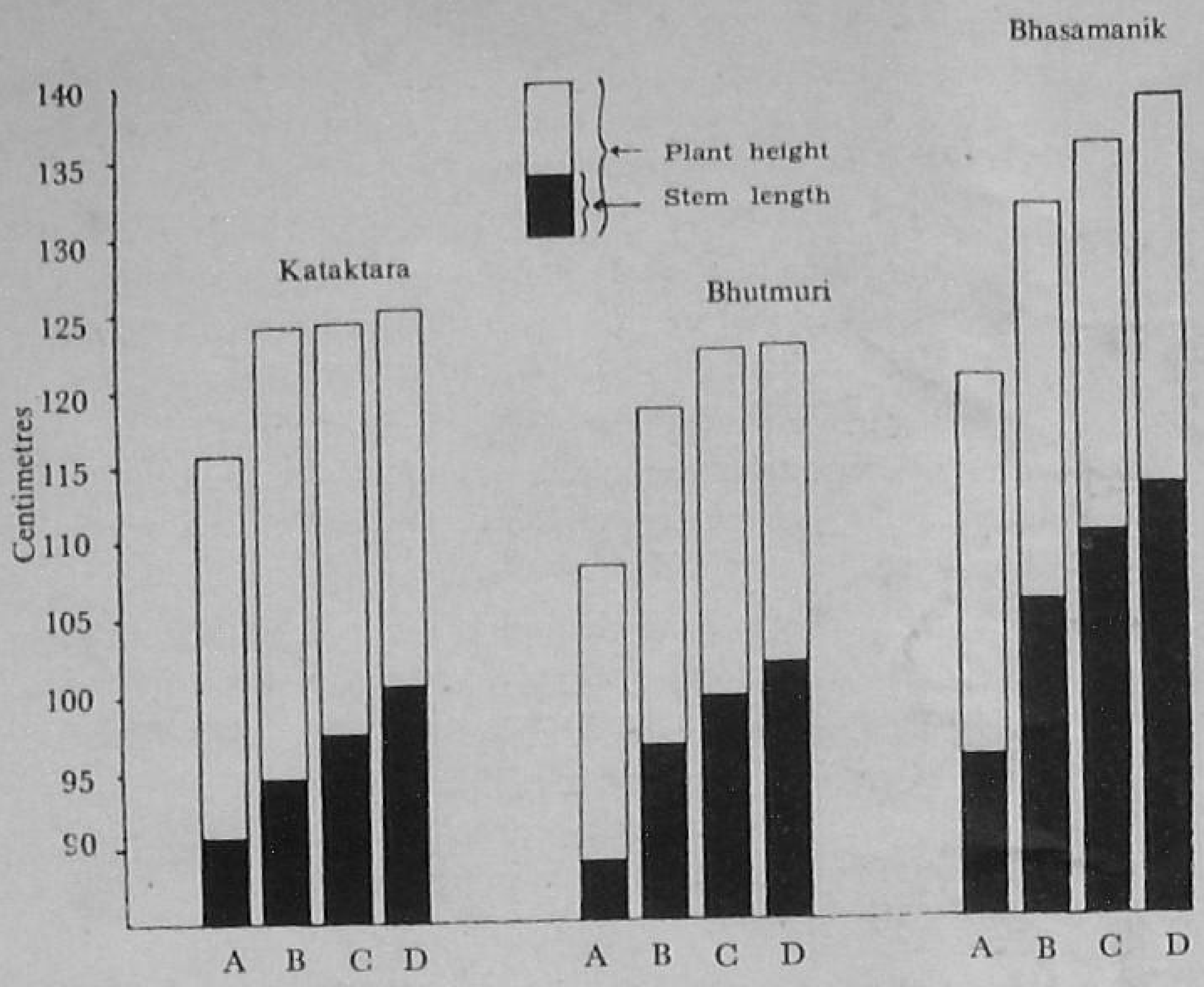
For decades now LIFEBUOY Soap has been used as a 'Health Soap' in India, and as a means of washing away germs in dirt. Because it is also economical in use, LIFEBUOY has an important role to play in our villages.



LIFEBUOY SOAP

A product of Hindustan Lever Ltd.

L. 9-X52



Increase of plant height and stem length with rise in water level

A. No water
B. Water up to the soil level
C. Standing water three inches above the soil surface
D. Six inches of standing water

water level of two inches above the soil surface ; with further rise, there is a gradual fall in tiller number. Grain and straw yields are similarly affected, the maximum being at two inches of water level.

This shows that standing water throughout the life period of the plant after transplanting is not at all beneficial to the growth and yield of different varieties of *aus*, *aman* and *boro* paddies. Standing water in the early stage of the plant growth for about four weeks after transplanting and then water up to the soil level, have been found by Ghosh and Bhattacharjee to give the best results.

Singh and others have found that different varieties of paddy show considerable differences in their water requirements ; the seedling, pre-flowering, flowering and seed formation stages are the critical periods, when water requirements of the plant are the highest and when adequate irrigation should be given if there is lack of moisture in the soil.

Further study is in progress at the Rice Research Station, Chinsurah, to find out the critical periods for *aus*, *aman* and *boro* paddies after transplanting, when water is most necessary.

PRIZE FOR MODEL OF BULLOCK-DRIVEN SEED-DRILL

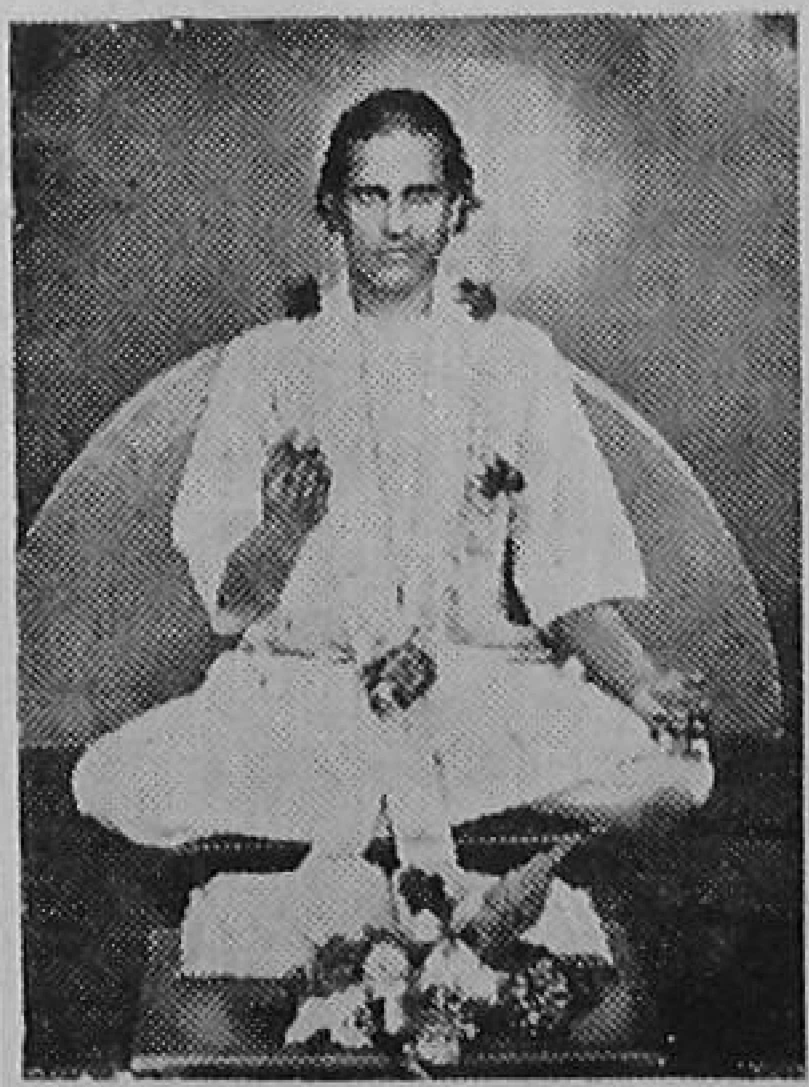
A prize of Rs. 5,000 will be awarded to any firm or individual submitting the best model for a suitable bullock-driven seed-drill capable of sowing four to five lines at a time of all kinds of seeds, with slight adjustments. The drill should be multi-tine and cheap, and have a simple mechanism, so that in case of breakdown it can be easily repaired under village conditions.

The working model should be sent to the Secretary Indian Central Jute Committee, 4, Hastings Street, Calcutta 1, by March 31, 1960.

Umesh Yoga Darshan (FIRST PART)

In Four Languages: English, Hindi, Gujarati & Marathi

Author: Shri Yogiraj Umeshchandraji



Shri Yogiraj Umeshchandraji

An excellent treatise on the true meanings of Yoga, which explains to you how to control your digestive, nervous, respiratory, urinary and other body systems. The book is fully illustrated with 108 real Asana Photographs and explains to you about their efficacy in attaining complete remedy of various ailments or disorders through the medium of Yoga, Naturopathy, Chromopathy, Psycho-Therapy etc.

Useful for men and women alike, young or old, healthy or unhealthy. Deserves a rightful place in every home, hospital and library. Price : Rs. 15|- plus Postage Rs. 2|- extra. No V.P.P. sent.

RAMTIRTH BRAHMI OIL Registered. Special No. 1.

An invaluable hair tonic for the prevention of dandruff and falling hair. Manufactured scientifically with many precious ingredients, which cools brain, improves system, and brings sound sleep. Most ideal for body massage. It is useful to everyone in all seasons. Price: Rs. 4|- for big bottle and Rs. 2|- for small. Available everywhere.

SHRI RAMTIRTH YOGASHRAM
Dadar, Central Rly., Bombay-14. Phone : 62899

READERS WRITE

Trace Elements

Various trace elements seem to play a very important part in increasing crop yields. Unfortunately, very little data is available as to the trace element requirements of our major crops like paddy, wheat, jowar *and* bajra, *and vegetables like cabbage, brinjal, etc.*

If any experiments have been carried out in this connection, I would like to be enlightened on the subject.

—Pannalal Javeri
Patasa pole, Ahmedabad

WITH a low level of crop production, organic manures provide enough micro-nutrients or trace elements to meet the soil needs. But with higher production and the use of concentrated, synthetic, high-grade fertilizers like urea, ammonium nitrate, di-ammonium phosphate, mono-ammonium phosphate, etc., the problem of the supply of micro-nutrients is likely to become more acute. An adequate supply of micro-nutrients is essential for the efficient use of major nutrients. The hidden hunger for micro-nutrients is manifested when major nutrients are present in the optimum.

Copper, manganese, iron and zinc are chiefly concerned with the oxidation-reduction reactions (reactions involving oxygen, chlorine and substances containing them, on the one hand, and hydrogen, metals and similar substances, on the other) in the plant. Magnesium is a constituent of chlorophyll and is considered to play an important role in the translocation of phosphorus in the plant. Boron affects cell-division, nitrogen and carbohydrate metabolism, pollen germination, fruiting, flowering, absorption of minerals, movement and action of hormones and water relations in plants.

Experiments have been conducted with micro-nutrients on various crops and the results are given below.

In paddy, soil application of copper gave yield increases of 35 to 85 per cent in the Konkan and Maharashtra. Spraying ten pounds zinc sulphate gave ten to 28 per cent increase in yield at Coimbatore. At other places, however, no response to copper or zinc was noticed.

At the Indian Agricultural Research Institute, New Delhi, soil application of five pounds each of copper and zinc and ten pounds each of manganese and magnesium in the case of wheat, stimulated growth and increased grain yield by 16.6, 30.3, 12.0 and 20.8 per cent, respectively. The corresponding increases with foliar application of one pound of each of these elements was 14.5, 6.4, 16.1 and 18.6 per cent, respectively. Good response to zinc was obtained on soils of Poona, Kolaba and Ratnagiri. On the desert soils of Rajasthan, these micro-nutrients failed to give any response.

In Khandesh and Bangalore, highly significant increase in yield of *jowar* was obtained with copper. At the I.A.R.I., New Delhi, spray application of five pounds ferrous sulphate gave good response.

Micro-nutrient requirements of *bajra* appear to be low. *Ragi* responded to borax applied to soil or by soaking the seed before sowing.

In Madhya Pradesh and Gujarat, increased yield of American and Indian cotton varieties was recorded by application of manganese, zinc and boron.

In preliminary spraying trials conducted in Andhra Pradesh and Bihar with copper, manganese and zinc, the quality of sugarcane was improved, with no increase in yield.

On sandy soils of Sabour and Islampur (Bihar), application of manganese increased gram yield by 13.4 to 20.0 maunds per acre.

It is obvious from these experiments that applications of copper, manganese, boron, zinc, molybdenum and magnesium have increased the yield of field crops in some places, but not in others. More critical experiments are necessary. Under most conditions, spray application is likely to be more effective than soil application, as this would avoid "fixation" in the soil.—*Abstracted from the "Indian Journal of Agronomy"*

CONTD. FROM PAGE 5

Man of the Month

the tree trunks for control of various insect pests and fungal diseases.

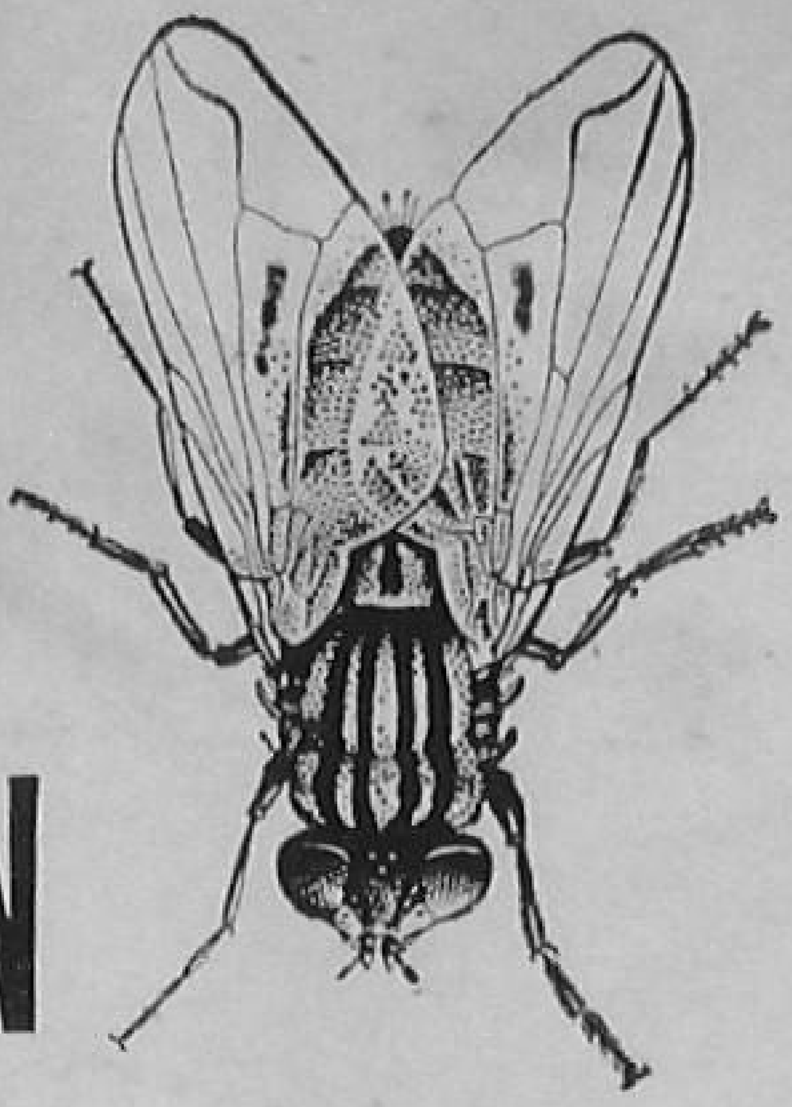
Flying-foxes are also very troublesome during night. Up till last year, petromax gas lamps were used to combat them. Temporary electrification of the orchard has now been done, which has greatly eased the problem.

Another nuisance are monkeys, which are kept in check by shooting.

A wave of cold weather damaged the crop in 1956. Hailstorms do not occur in this area.

Shri Singh has 254 trees in his orchard, of which 212 are bearing. Shri Singh marketed 475 boxes from his orchard in 1957, which fetched Rs. 25,500. In 1958, about 725 boxes were marketed for Rs. 39,400. His total expenditure on the orchard this year came to Rs. 10,000 ; his gross income, Rs. 45,000. He sends all his produce to the Delhi market, and sometimes as far as Calcutta and Bombay too.

MALATHION



KILLS FLIES FAST

Insecticides containing MALATHION are deadly against flies and fly maggots, even to those that have become resistant to chlorinated hydrocarbon insecticides. MALATHION, because of its very low toxicity to man and animals, is one of the safest insecticides to handle. It is ideal for spraying in cowsheds, poultry houses, around water troughs, sheep pens—anywhere where flies gather and breed. One treatment is effective up to 21 days. When your insecticide contains MALATHION—you know that your fly control is certain.

MALATHION preparations are available from your local Dealer.

CYANAMID

CYANAMID OF GREAT BRITAIN LIMITED, AGRICULTURAL DIVISION, BUSH HOUSE, LONDON, W.C.2

Printed at NATIONAL PRINTING WORKS
(THE TIMES OF INDIA PRESS), 10 Daryaganj, DELHI.

Regd. No. D. 571

Genuine Spare Parts For

FERGUSON
MASSEY-HARRIS
MASSEY-FERGUSON
TRACTORS & IMPLEMENTS

are available only from officially appointed
Distributors and Dealers

MASSEY-FERGUSON (INDIA) LTD.
BANGALORE

Incorporated in the United Kingdom   Liability of Members Limited